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CLEAN WATER FOR THE NATION'S ESTUARIES. PROCEEDINGS OF THE NORTH CAROLINA PUBLIC MEETING, NEW BERN, NORTH CAROLINA, JULY 26, 1968

Federal Water Pollution Control Administration
Charlottesville, Virginia

July 1968

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CLEAN WATER

....FOR THE NATION'S ESTUARIES

PROCEEDINGS OF THE
NORTH CAROLINA PUBLIC MEETING
NEW BERN, NORTH CAROLINA
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LUTION CONTROL ADMINISTRATION - U.S. DEPARTMENT OF THE INTERIOR
ATLANTIC REGION CHARLOTTESVILLE, VIRGINIA

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Public Meeting held in New Bern, North Carolina, on Friday, July 26, 1968, before the National Estuarine Pollution Study, Federal Water Pollution Control Administration, Department of the Interior.

Colonel George E. Pickett: I would like to get the public meeting started and underway, and would like to ask Mr. Livingstone Stallings, the Chairman of the Craven County Board of Commissioners to make an opening statement, and have an invocation, please.

Mr. D. Livingstone Stallings: Good morning, if I may, I would like first to call on Mayor E. H. Ricks, and ask him to come forward and give the invocation.

(Mayor Ricks gives the invocation)

Mr. Stallings: Thank you, Mr. Ricks. Ladies and gentlemen, members of the Study Committee, members of the Department of Water and Air Resources, it's a real pleasure on behalf of Craven County that I have to welcome you here today. We are delighted to have this much evidence of interest in the problems that are going to be discussed. It was my pleasure to meet many of the group last evening and it was at that time that I learned that the reconnaissance flight that was taken yesterday over the estuarine areas of North Carolina, was the first such flight that had been attempted for this purpose. This was more or less an experiment to see just what part such a flight or aerial survey could have in the conducting of this study. We're delighted that you chose this area in which to make this experiment. We're delighted in New Bern and Craven County that you chose us as the location for this meeting today. We appreciate the efforts that Mr. George Pickett and his group have made in setting up the plans for this meeting and trying to work for the convenience of the Federal Study Group that is working in this area.

On behalf of Craven County I would just like to make one very simple statement and it is to this effect; we believe that our Department of Water and Air Resources in North Carolina, is doing an outstanding job in this matter of estuarine pollution. We realize that there are many steps yet to be taken but we feel that North Carolina and local authorities are in the best position to regulate problems that may arise. We do appreciate all of the suggestions, all of the resource material and the results of studies that come from the Federal level. We realize the help they can give us and we welcome your continued help, but it would be our plea that so long as State and local authorities show evidence of willingness to work in this area that these problems be left to local control. We assure you on the local level from Craven County that it is our desire, to the extent that Craven County may have such estuarine areas as you are concerned with, and certainly we have many streams, and we're concerned about the keeping of these streams clean; keeping them healthy from the standpoint of fish and wildlife growth. It will be our every desire to work in the direction of maintaining these in that

Included in report are data on: Estuarine zones; legislation; pollution control; flooded fresh and salt water marshes; tidal marshes; tidewater programs; and landfills

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fashion, but we do confidently feel in Eastern North Carolina, that these areas, we can perhaps from the local level work best on.

We're delighted to have all of you today. I see many friends from neighboring counties. We hope that you are going to find your stay here today profitable; we know you will, and if we can add anything to your convenience and make your stay here more comfortable, we hope you will call on us. We're glad to have you, thank you, and I want to especially thank Colonel George E. Pickett and his group for all of the cooperation and help that has been shown to Craven County in recent days in working out our mutual problems. They're doing a fine job and we're delighted to have you all here today, thank you.

Colonel Pickett: We have Mr. Olin Wright of the Craven County Chamber of Commerce. Olin, would you like to say a few words.

Mr. Olin A. Wright: My name is Olin A. Wright, Manager, New Bern - Craven County Chamber of Commerce. Mr. Holdaway, Mr. Pickett and gentlemen, I wish to thank you for the privilege of appearing before you this morning to express my personal views and the opinions of my Board of Directors on the optimum use of our estuarine resources, their value, damages incurred due to pollution and how the estuarine resources should be managed.

The optimum use represents many facets; to name a few, irrigation, drainage projects, aquatic recreation in all its many aspects, fish and wildlife propagation, industrial development, tourist attractions, water commerce and others.

The industrial significance of our waterways is demonstrated by the fact that in 1964, 18,616 tons of aggragate and methonal were shipped out of the port of New Bern; in 1965, 222,474 tons and for the first six months of 1966, 94,414 tons were shipped. We have no figures on the many thousands of tons of pulpwood which have been shipped via water commerce in the last few years.

This tonnage and economic impact will be greatly augmented if and when an improved channel can be provided to serve our existing industry in this area.

An eighteen foot channel to serve our New Bern ship yards and a twelve foot channel up stream to serve the Weyerhaeuser Company complex and interim industrial sites are badly needed. The cost benefit ratio can easily be justified.

The eighteen foot channel, however, is contingent upon an access from Pamlico Sound to the ocean which would be provided by the Texas Gulf Sulphur Company's Beaufort Inlet project and related mineral resources development in Beaufort and Pamlico Counties.

It is estimated that the fishing industry adds some $6,000,000 per year to the economy of the area.

Craven County enjoyed a $50,343,000.00 tourist trade in 1967 according to the economic analysis survey by Dr. Lewis C. Copeland, Department of Statistics, University of Tennessee. Long weekends have greatly enhanced the recreational attractiveness of our rivers and streams as is demonstrated by the continual stream of outboard motor boats and automobiles arriving from up State to enjoy boating, bathing, skiing and fishing.

I feel unqualified to express an opinion as to the damages incurred by estuarine pollution due to the fact that we have experienced no pollution problems of any consequence. We do believe, however, that the balance of nature should be preserved.

In view of the above economic reasons, we heartily recommend that continued appropriate steps be taken to protect our natural resources and reserve a portion of waterways for industrial development.

We take this occasion to compliment and congratulate our own North Carolina Department of Water and Air Resources for their excellent performance in protecting our natural resources and their cooperation with industrial development. We would particularly note the outstanding work done by the Department in recent years in the areas of classifying North Carolina streams and maintaining the water quality. We strongly feel the primary responsibility of executing these controls should be that of the North Carolina Department of Water and Air Resources.

Colonel Pickett: Thank you very much, Olin. Are there any members of the United States Congress or their representatives here today? I received a telegram from, a joint telegram from Congressman Lennon and Congressman Henderson, expressing their regrets that they were unable to be here today, and I have their presentation that I will read to you later.

Are there any members of the North Carolina legislature here? (No reply)

I would like to introduce to you our panel. First, Mr. P. Greer Johnson, a member of the North Carolina Board of Water and Air Resources, and chairman of the Water and Air Pollution Committee.

Mr. W. Grady Stevens, a member of the Board of Air and Water Resources.

Colonel R. G. Page, Chief, Department of Water and Air Resources

Doctor David Adams, Commissioner of the Commercial Sports Fisheries.

Mr. Darwin Coburn, Chief, of the Water Pollution Division, Department of Water and Air Resources.

Mr. Frank Turner, Property Control Officer, State of North Carolina.

. Doctor Singer, Assistant Secretary of Interior, and Mr. Stewart Crisher, North Carolina Wildlife Commission.

Would you like to introduce any more of your people? Do you want to take over now?

Mr. Eugene Jensen: I'm fairly newly appointed as the Director of the Middle Atlantic Region of the Federal Water Pollution Control Administration. Until recently I was Director of the Estuarine Study being conducted by the Federal Water Pollution Control Administration on behalf of the Department of Interior. Two other members of the panel here, Federal members of the panel are Gary Gardner on your right, who is from our office in Charlottesville, and Mr. DeCamp, who is the Project Director from Washington, D. C.

I would like to add my thanks to the Commissioners of Craven County for the use of this very excellent courtroom auditorium. I think it's one of the nicest facilities that we've had an opportunity to use so far in the fifteen or so hearings that have been held. I also want to express my appreciation to the excellent assistance that we have had from the Chamber of Commerce in organizing the local details of the meeting. This is important in trying to have a successful function of this type.

The background of this Estuarine Legislation must be discussed briefly, very briefly to give us the framework for the discussion that will be held here today. The Clean Water Restoration Act of 1966, Federal Legislation, directed that the Federal Water Pollution Control Administration undertake a very broad study of the estuaries of the United States, their size, uses, problems. The word, "pollution" of course received considerable prominence in this but the language of the act is very broad. It talks also about economics and all sorts of things that would influence how the estuaries may be used, the problems that may be encountered in them.

The objective of the act is to develop recommendations to the Congress for a national program for the preservation, study, use and development of the nation's estuaries. The act is specific in saying that the study shall be conducted in cooperation with State governments, local governments, also interested groups and private citizens. It also says that the recommendations that go to the Congress must take into account the respective responsibility of local and state governments and of the public and private sectors of the community.

So again we are attempting to get a very broad view as to the estuaries, their past, their present, and hopefully their future.

In organizing the study the Secretary of Interior wrote to the Governor and asked for his assistance in identifying the programs which are carried on by the various State agencies and also asked for his assistance and cooperation, if he so desired, in holding meetings in each of the coastal States, to give local agencies, local interest groups, local governments and the private citizen who is interested in the estuaries, a chance to express their opinions and their views. The purpose of this meeting then is to do just exactly that: to give local agencies, local groups, the private citizen an opportunity to be heard.

In general we will not have statements presented by the State agencies. The Federal agencies will not present statements. This does not mean they are not interested and not involved. It simply means we have made other arrangements for getting their ideas and that this time then, has been reached and set aside for local governments and the groups, the private citizen.

We have held about fifteen such hearings so far. We have gathered a great amount of information on what people think about the estuaries and what they think their future should be. As a general set of ground rules, we have found that it is advantageous to use this approach, and under this approach individuals may make statements and the members of the panel may ask them questions to amplify portions of their statements or to help to develop additional ideas that may be useful to us in the eventual preparation of this report to the Congress. So that ordinarily we will not accept questions from the floor directed to persons who may make statements. However, anyone that wishes to contribute further to the record which will be made here today, simply inform Mr. Gardner or Colonel Pickett or myself and we will be delighted to have your statements included in the record. This will be, if you cannot do it now or if you so desire the record can be held open for approximately two weeks for the submission of additional material.

One additional request and that is that we do have a registration card filled out on you. It's quite important to us that we know who is here and how many people are here and the agencies that they may represent. So, if you have not filled out a registration card we hope that you would later in the morning. Now, I think I'll turn the meeting back over to Colonel Pickett and we can start on the first of our statements.

Colonel Pickett: I have several statements that have been forwarded to me that I would like to be entered into the record. I will read those. I have first Congressman Henderson's statement and I have copies of that for the press.

"Statement of Congressman David N. Henderson
for Public Meeting, Friday, July 26, 1968
Craven County Court House, New Bern, N. C.
on
NATIONAL ESTUARINE POLLUTION STUDY

As a member of the House Public Works Committee, I am very interested in and concerned about water pollution. Congress long ago recognized that it has a legitimate interest in water pollution and under the provisions of the Federal Water Pollution Control Act, we have, for many years, provided for federal grants-in-aid to assist States and municipalities in providing for sanitary sewer systems.

In enacting the Clean Water Restoration Act of 1966, we adopted an amendment providing for a special study of estuarine areas. All of us recognize that those areas in which the tide ebbs and flows present a different problem than the inland areas of rivers where the flow is strictly 'downhill' so to speak.

We feel that bays, large rivers, tidal creeks, and salt marshes all have a peculiar problem in that when the natural flow of the current brings sources of pollution to the point where it meets incoming tidal waters, this has a tendency in some instances simply to toss pollution back and forth; in others, the tendency is for the pollution from upriver areas to reach tidal waters and then simply stop and slowly spread over a wide area, settling to the bottom and contaminating it at a far greater rate than it does swiftly moving water where the current is strong.

Of course there is a great deal we in the Congress simply do not know about the special problems of estuarine pollution, and in order for us to legislate intelligently, we need more knowledge.

That is the reason we have authorized this study and we urge all interested parties to cooperate fully with the Department of Interior and make available to its investigators all pertinent information which they may have. It is our hope that as a result of this study, we will learn the best and most efficient approach for us to take in adopting appropriate legislation to help abate pollution in estuarine areas."

My next statement is from Congressman Alton Lennon, which is as follows:

"Statement of Representative Alton Lennon
at Public Meeting
on
ESTUARINE POLLUTION CONTROL
New Bern, North Carolina

July 26, 1968

Mr. Chairman and Friends:

I appreciate the opportunity to express my interest in the National Estuarine Pollution Study being conducted by the Federal Water Pollution Control Administration in conjunction with State officials and private organizations.

This is an important study deserving the full cooperation and resources of the Federal, State, and local governments, to preserve our coast. Shoreline degradation from erosion has reached a level of urgency along much of our coastline. Economic development in too many cases has been accompanied by pollution of our harbors and bays.

Our shoreline resources need to be developed to their full potential, and it must be done wisely with the tools that science and technology can provide. There needs to be full cooperation in the use of the coastal waters by industry, water-related recreation users, commercial fishermen, sport fishermen, oystermen, and harbor and port developers. The dumping of garbage, sewage, and industrial waste into our waterways must be controlled to protect the health and welfare of millions of people who use the coastal zone.

New housing developments and industrial expansion are certain to locate on such Rivers as the Cape Fear, the Neuse, Pamlico and Albemarle Sound River systems. Plans are needed now to effectively treat the waste that will also come with these improvements.

The industrial, recreational, and commercial fishing interests of North Carolina will be served by this water pollution control study, and action resulting from this study will favorably affect the future use and conservation of our coastal resources."

Congressman Jones also informed me that he regretted that he would be unable to be here. As you know Congress is trying to clean up their calendar in order that they can go home in early August and they're mighty busy, working at nights and staring early in the mornings.

I talked to Senators Jordon and Ervin and they also expressed their regrets that they would be unable to be present.

The next statement is from Muncey L. Daniels from Manteo. It says, "Due to pressure of business at home and personal factors I will be unable to attend the meeting in New Bern," and he asked me to read his statement as follows:

"July 27, 1968

STATEMENT OF ESTUARINE ZONES OF NORTH CAROLINA

by M. L. Daniels, Jr., of Manteo, N.C.

There has been and is now much being said about the Estuarine Resource of our State and Nation as they relate to fish and shell fish. In my work on this I have found as follows:

1. There are at least two kinds of these marshes or resources.

A. Marshes that the tides flow over daily year in and year out.

B. Marshes that are under water only when there are storms or unusual weather conditions.

Since most biologists that I have talked with say that 1-B has no value to fish and shell fish for the simple reason that the marshes are dry 90% of the time, then we would seem to have no use or concern with these in this work. They should be used for any and whatever benefits they could produce for mankind - industrial, recreational or other.

We now return to 1-A, this seemingly being what we should be concerned with. Let me say at this point that I have never talked with a biologist who could tell me how many fish one or more acres of marshland supports - if any? Indeed, I have talked with those who are familiar with the Coast of Southern California and Northeastern United States where only rock coastlands exist with no marshes. Yet they have large quantities of fish. This would seem to point to the idea that the sounds, rivers and oceans raise their own fish, and that marshlands have little if any effect on the fish. This tends to show that water temperatures, salinity of the water, etc., are the principle factors involved with fish life.

So at best we are dealing with unknown and unproven factors in the fish life cycle. This means that much more work should be done in research and conservation of the small fish until something better has been proven.

As for the marsh areas themselves, there are literally hundreds of thousands of miles of these in the sounds, rivers, and creeks of North Carolina. No one could possibly foresee the complete destruction of these areas in the next thousand years or more. Even if we could, it would seem to me that we could and should give serious consideration to their value to man in the known quantities of recreation, general commercial and industrial use and actual dollar return to provide a better living and way of life for man. It might be well in evaluating this statement to keep in mind:

1. That there is no proof that these marshlands support and raise any proven or even estimated number of fish per acre of marsh.

2. That sections of our country having no marshlands do have plenty of fish.

3. That many of the oceans have fish (Blue Fish, Sword Fish, Sail Fish and many others) that have no known connection or association with marshlands or any inland waters. Yet we have these fish. Does this tell us that we should practice more conservation and research?

Respectfully submitted,

M. L. Daniels, Jr."

The next letter I have is from the City of Goldsboro, and from Mayor T. R. Robinson, Jr.

"Mr. George Pickett, Director
North Carolina Department of Water and Air Resources
P. O. Box 9392
Raleigh, North Carolina

REF: Public Meeting
July 26, 1968
New Bern, North Car.

Dear Mr. Pickett:

The following statements are based on use of estuarine resources within the Neuse River and Little River basin: The City of Goldsboro is rapidly growing and due to this growth must make immediate plans to obtain raw water from a supply other than now used. The Neuse River being our only assured adequate supply, we are quite concerned that proper measures be taken to control pollution with this River and its tributary streams.

The best use of estuarine resources within the general area of Goldsboro is recreation, wildlife conservation and water supply. It is becoming exceedingly important that additional recreation provisions be planned and the development of such along the Neuse River would greatly ehnance use of the area. The condition of the Neuse River Basin greatly encourages its use for limited wildlife conservation.

I highly urge that immediate steps be taken to study the existing resources along the Neuse River and plans be made to control the use of these resources with conservation and pollution control as an area of major concern.

Sincerely,

/s/ T. R. Robinson, Jr.
Mayor"

I have a statement here by or from the Chamber of Commerce of Elizabeth City, signed by the Executive Vice President, George Attix, which is as follows:

"We want to thank you for the opportunity to present a statement at this public hearing concerning the effects of pollution in the estuarine areas of the Albemarle area of Northeastern North Carolina.

As you no doubt know the area surrounding the Albemarle Sound including the Outer Banks of North Carolina is one of the greatest hunting and fishing areas in the country. Consequently, our concern with the pollution of the water in this area is more than it might be in other areas where their interest is strictly domestic pollution as concerns drinking water and bathing.

In our area we're not only concerned with that but also with the results of pollution as it effects sport and commercial fishing and wildlife feeding areas, as well as the vast recreational use of our waters.

We are presuming that the North Carolina Department of Water and Air Resources will continue their fine work in cleaning up the streams, rivers, and inlets of North Carolina as concerns domestic and industrial water pollution. Most of the cities and towns in our area now have or are in the process of developing sewage disposal plants. The large contributors to commercial pollution are also being taken care of by the North Carolina Department of Water and Air Resources. The next phase; the control of individual violators, will be more difficult and probably more time consuming and demanding. The Elizabeth City Chamber of Commerce will cooperate and help in any way they can.

At this point it might be well to point out that to our knowledge there are no State Sanitary Laws concerning boats in

North Carolina salt waters. Since boating is becoming more popular day-by-day, and since the inland waterway passes through this area via various routes, it might be well to investigate the passage of some sort of State sanitation regulations controlling the salt water or estuarine areas.

The breeding grounds for fish are of great importence to even more than our particular area, as many species have their spawning area here even though this is not their normal habitat. So it might be well to have a study made of the small inlets and tributaries to the Pasquotank River as well as the others to the Albemarle Sound to determine that they are not blocked by silt which would keep the fish from using them. The land in our immediate area is old and has been cultivated and used for farming purposes as long as any other in the country; and the drainage from these farms has a habit of silting up the streams so that drainage is not adequate. There was a time when the ebb and flow of our (wind) tide could take care of this condition, but with the constant addition of land in cultivation, this is now questionable.

We welcome the real estate boom in the area, particularly the water subdivisions which are aimed primarily at second homes for the summer and weekends. Most of these subdivisions, however, have canals interlacing the subdivision so that most of the lots afford their own boat launching areas. Is the urbanization of these streams and these man-made canals having any damaging effects of pollution in the estuarine zones, in regard to fish and wildlife? If it is, what can be done to improve or correct this condition, so that fish and wildlife can continue to increase?

There are no oyster or clam beds in the Pasquotank River or its tributaries, but in the other areas of lower Albemarle Sound, care should be taken and perhaps a study made on the effects of channel dredging for navigation and the damaging effect if any in the spoil area.

Again let us thank you for the opportunity of presenting this statement which is not too original and probably has been or will be presented several times at this meeting. Our North Carolina Department of Water and Air Resources is doing an excellent job and we are glad to learn that they are going to have the backing and help of the United States Department of the Interior, Federal Water Pollution Control Administration.

Respectfully submitted,

/s/ George Attix
Executive Vice President
Chamber of Commerce
Elizabeth City, N. C."

July 26, 1968, 9 AM
Courthouse
New Bern, N. C.

Colonel Pickett: That concludes the statements that I have here. Mrs. Sturmer, would you like to make your statement now. (She indicated she would not at this time) There are several people here who asked to make their statements early in that they have other appointments. Mr. Utley, from Carolina Power and Light Company, would you like to make yours while she's gone to get her speech.

Mr. Utley: Colonel Pickett, Members of the Board of the North Carolina Water and Air Resources, and members of the Interior Department, my name is Edwin E. Utley, and I am Manager of Power Production for Carolina Power and Light Company. On behalf of Carolina Power and Light Company, and the individuals within the Company to whom invitations were sent, I wish to express our appreciation to the North Carolina Department of Water and Air Resources and to the Department of the Interior for inviting us to this hearing, for the purpose of discussing the optimum use of estuarine or coastal waters. We hope that this study will result in a deeper and broader understanding of the value of these estuarine waters to the State of North Carolina and will recognize the manner in which the overall needs of the citizens may be fulfilled with complete and proper management of such areas.

Carolina Power and Light Company provides electric service throughout much of the eastern and coastal areas of North Carolina. Sixteen years ago when our Company merged with Tide Water Power Company, which formerly served much of this coastal area, our entire system generating capability was less than 800,000 kilowatts. Today, our generating capability has to over 3,000,000 kilowatts. This increase is almost fourfold, which illustrates the rapid economic growth and progress of our service area including, in particular, the coastal areas of eastern North Carolina. The staff of our Industrial Development Department and others within our Company work in cooperation with the State representatives toward bringing new industry and business into North Carolina, as well as promoting the development of existing businesses. The construction of this Company's generating plants and other facilities not only provides electricity which is essential to the continued well being of our citizens and industry, but the investment substantially increases the tax base of local governments and provides employment for local residents. We are, therefore, deeply concerned with and involved in the total development of the coastal areas of our State for the maximum benefit of all people.

Approximately 90 percent of the total generating capacity of this Company is steam-electric, requiring water for cooling purposes. In addition to this Company's steam-electric generating plant located near Wilmington on the Cape Fear River, the Company has plans to build two nuclear generating units in Brunswick County near Southport. These units will go in service in 1973 and 1974 with a capacity of 800,000 kilowatts each. A third nuclear generating unit has been ordered for installation as early as 1975 at a location to be determined. The two nuclear units planned for Brunswick County represent an investment of approximately 200 million dollars, thus greatly adding to the existing tax base of that County which is about 100 million dollars. In addition, it will provide low cost electricity for people throughout this Company's service area.

The use of water for cooling purposes is essential in the operation of these and other steam-electric generating plants. Thus, the management and conservation of water in these estuarine areas is of great importance to Carolina Power & Light Company. We are convinced that the North Carolina Department of Water and Air Resources and its staff, as reorganized and strengthened by recent legislation, is highly qualified to supervise the management of our local water resources, including particularly those in estuarine areas. After several hearings, and after consultation with representatives of the Department of the Interior, the North Carolina Department of Water and Air Resources has adopted water quality standards for both inland and coastal waters in the State. Because conditions vary greatly between areas throughout the United States, it is of paramount importance that the flexibility of local control over the management of these waters be maintained. Temperature standards suitable for North Carolina waters would certainly differ greatly from those appropriate in either Maine or Florida. Also, even within a State, local conditions must be given consideration; so that estuarine waters may be put to their best use whether that use is determined to be solely the propagation of marine life, or mineral exploration and development, or cooling water for generating electricity, or other uses, or a combination of these uses. The present State temperature standards, which are quite restrictive in certain areas, should be achievable and should well protect the aquatic life in our estuarine and coastal waters. Further, and most importantly, these standards and their application will encourage the full development of our coastal areas for the greatest benefit to all the people of the State.

Recently, in commenting upon the standards adopted by the North Carolina Department of Water and Air Resources, the Secretary of the Interior took certain exceptions because the standards did not contain a so-called "non-degradation clause." This clause would require, in effect, a permanent status quo for all water quality and would restrict uses involving any reduction in the existing water quality. Such a provision is not only unnecessary, but we believe would be detrimental to the continued development of the State. At the present time, our State has vast estuarine water reserves that can be utilized as sources of cooling water before conditions may be such that there could be interference with the ecological balance. Such a clause further ignores the fact that many areas of coastal waters have greater potential benefit for use for the people of our State in ways other than solely for the development of marine life. We urge, therfore, that any recommendations following this study recognize that local variations of water quality in estuarine areas are essential to the optimum use of such areas, and that changes from time to time in water quality are essential in developing such optimum use. It is also hoped that these recommendations will not contain an arbitrary, so-called "non-degradation clause."

The temperature standards recently adopted by the North Carolina Department of Water and Air Resources, considering a reasonable mixing zone, should not prohibit the use of estuarine and coastal waters for power generating, generation cooling requirements. If, however, stricter standards were imposed on all estuarine waters, the use of these waters for steam-electric generating purposes might be seriously curtailed. More restrictive standards might well require expensive additional equipment for future plants that could increase the capital cost of these plants by as much as 20 percent or more. Further, many potential sites for future plants will be eliminated, and the value of all future sites will be limited. Such additional capital expenses of this type would ultimately be borne by the consumer through higher electric rates. Further, an increase in the cost of electric power would place this service area in a less attractive position for future economic growth.

As to the effects of warming waters, the April 22, 1968, issue of ELECTRICAL WORLD Magazine contained an article reporting experience in Great Britain during the past nine years with thermal effects from nuclear generating plants. This article states:

> "In Great Britain, however, where some nuclear plants have been on line for years, biologists have been keeping close tabs on thermal pollution from nuclear as well as conventional stations. And after nine years of study they are sure the term, 'thermal pollution' is a misnomer, and that there is no evidence of an ecological disaster of any kind which could be attributed to a British power station."

There is evidence to support the theory that warm water is actually beneficial to aquatic life if managed correctly. On June 3, 1968, Mr. David S. Black, Under-Secretary of the Department of the Interior, made the following comments before a national symposium on the effect of increasing the temperature of receiving waters:

> "The issue is the effect of heat upon the ecology of the receiving water system. Some increases in temperature may serve advantageously, and the task must not be approached negatively. Concerning the constructive use of waste heat, studies are currently being carried out by industry and by the Government. For example, in the Pacific Northwest, tests are being conducted to see if the heated water can be used for irrigation. Naturally, there have to be safeguards, but with proper caution, it may be possible to extend the growing season and thus make constructive use of the waste heat. Warm water cultivation of oysters is being attempted in the East and in the State of Washington. What a treat for the oyster lovers if the experiments make it possible for oysters to spawn continuously for 10 months a year to reach their maturity in two and one-half years."

In connection with our presently planned construction of a nuclear generating plant near Southport, we have had underway for several months an investigation to determine the characteristics of the Cape Fear estuary and the effect of heated waters from the generating plant on this estuary. This investigation, being conducted by independent consultants with broad experience in estuarine ecology, has researched existing data so that a comprehensive program may be planned to explore those areas in which more knowledge is required. The ultimate objective of this study will be to demonstrate that the proposed plant design will be compatible with the major environmental characteristics of this estuary. It is hoped that results of this and other studies will provide information to increase the value of these bodies of water for the benefit of the general population. Carolina Power & Light Company's concern for protecting the natural resources in our area should be clearly demonstrated by the foregoing investigation as well as by the manner in which existing plants are operated.

In making studies to guide further improvements in the management program, the beneficial effects of warm water from steam electric plants should be given full consideration. Certainly, until more is known about these beneficial effects, there should be no unduly restrictive regulations which assume, without supporting evidence, that there will be interference with the ecological balance simply from the warming effect of the water. As in the past, CP&L is committed to the management of water resources for the best interest of the people of North Carolina.

While perhaps some estuaries should be protected and preserved primarily for the benefit of marine life, not all estuaries are in this category and each area deserves individual study and evaluation. For example, the use of estuarine waters for cooling purposes, with reasonable limitations upon discharge temperatures would not interfere with marine life. There are many uses of estuaries which are essential to the welfare and progress of our citizens, other than for the propagation of marine life. It is this question, relating to the overall good for the greatest number of our citizens, which should receive paramount consideration.

We hope that the cooperative and successful efforts of the Department of the Interior and the North Carolina Board of Water and Air Resources, as they have existed in the past, will be continued throughout this study. We hope that the Department of the Interior will recognize the need for flexibility in managing local water situations and that there will be a continued recognition of the necessity for, and acceptance of, standards established by our local government. Also, in particular, the needs of the people of this State for plentiful low cost electricity must always be acknowledged. I thank you.

Colonel Pickett: Does the panel have any questions they would like to ask Mr. Utley?

Mr. Jensen: I have one question. Mr. Utley, you have made a statement-something to the effect that development of the coastal areas for maximum benefits will require some sort of a planning program; do you think that this planning program might be better carried out at the local level, county, at the State or at Federal level?

Mr. Utley: Our experience has been that our North Carolina Board of Water and Air Resources have done an excellent job in carrying out the management of our streams in North Carolina; of course, they work in close cooperation at the county levels and this is the plan that we feel would be most beneficial to the people of North Carolina.

Colonel Pickett: Next we have Mr. John F. Adams, who is President of the Neuse River Basin Association, Mr. Adams:

Mr. Adams: I am John F. Adams, representing the Raleigh Chamber of Commerce and currently the President of the Neuse River Basin Association. I am privileged to express the appreciation of both the Raleigh Chamber of Commerce and the Neuse River Basin Association for the aggressive interest being displayed by the Middle Atlantic Region of the Federal Water Pollution Control Administration and the North Carolina Department of Water and Air Resources in conducting this hearing.

The value of the control of our water resources is a great factor in the future development of our State. Effects of pollution on our streams and coastal waters can incur untold damages to water supplies, water power, fish and wildlife, and sport and commercial fishing, recreation, and the health and well being of our people.

We would like to encourage a strict control of the pollution of our streams in our State. We realize that sometimes this is a very touchy matter but here we come back to the right of eminent domain and this is absolutely necessary because control benefits the whole population.

We appreciate the opportunity of being heard at this meeting and we assure you of our continued support and cooperation. I thank you.

Colonel Pickett: Mrs. Frederick Sturmer, I understand that you do not want to make a public statement for the Garden Club of America, but you do want your statement incorporated into the record?

Mrs. Sturmer: Yes.

(Statement not available)

Colonel Pickett: It will be handled that way then. The next statement that I have on my list is by Joe Browder of the National Audubon Society, Mr. Browder:

Mr. Joe Browder: Thank you, sir. The National Audubon Society is aware that North Carolina has provided much of the leadership and interest in the effort to preserve our Atlantic estuaries. Your State officials, more than those in some other areas, recognize the value of productive estuaries.

However, there is something happening in another State now that I think may be of interest to everyone here. Although North Carolina's coastline is subject to increasing development pressure, the degree of that pressure can't compare to the feverish activity in Florida. The value of coastal property has skyrocketed so much that developers are anxious to chew up what's left of the State's natural shoreline, dredging and filling to create more sellable waterfront building sites. That kind of dredge and destroy development has been part of the State's tradition for so long, that what is happending now is really remarkable. The State Government has ordered a moratorium on dredge and fill anywhere on the Florida coastline. The prohibition against dredging applies even to privately owned coastal wetlands, and the regulation also prohibits the further sale of most State-owned baybottoms.

The moratorium will last until a team of scientists completes a survey of the entire Florida shoreline, recommending new bulkhead lines to protect those remaining coastal areas that are biologically worth preserving. In two weeks, a legislative committee will begin work on new laws, to back up the State's Executive action with legislation to further protect the estuaries.

A short while ago Florida's Government seemed determined to sell off the State's whole coastline to be dredged by private developers. Now the situation is completely reversed. This change of attitude didn't take place because Florida's political leaders all suddenly turned into fishermen. Like most other coastal States, Florida had long recognized the economic value of the fisheries industry. But that wasn't enough to prevent the destruction of the estuaries in the name of greater economic progress.

What changed things in Florida was the sudden realization on the part of the State's economic leaders that a lot more than fishing depends on productive estuaries. The Florida Development Commission is the State agency devoted to bringing tourists, industry and dollars to the State. Tourism is Florida's second biggest industry, and the Commission makes an annual survey to try and find out what it is that brings visitors to the State. Last year almost 19½ million tourists came to Florida, and they spent 4-point 9 billion dollars. Now you might think that the big lures would be gambling at the tracks and fronts, or living it up at the nightclubs and plush hotels. But the figures show dancing and night life in 10th place, and spectator events are number 11 on the list of activities that bring tourists to Florida. Those things looked forward to and enjoyed by Florida visitors are: Number 1, beaches and swimming, with the atmosphere of relaxation and fun, Number 2, natural scenery - - not manicured golf courses or lavish architecture, but natural scenery - - is in third place, followed by fishing and hunting. Commercial attractions come next - - and the most successful of those, like the seaquarium in Miami, for example, feature the display of colorful wildlife or natural beauty. After visits to historical places, the tourists want to enjoy national parks, State parks and boating.

The figures in this report aren't wishful thinking. The Florida Development Commission isn't what you'd call a conservation organization. It is an agency, responsive to interests that want to do whatever is best to build Florida's economy. So, it looks like Florida has learned an important lesson: our natural resources are productive in many ways, and if we are to remain healthy economically, as well as ecologically, our estuaries must be preserved. In the years that it took Florida's business and political community to learn that lesson, much was destroyed. The National Audubon Society hopes the citizens of North Carolina will act now to protect their estuaries. I thank you.

Colonel Pickett: Do any of the members of the panel have any questions for Mr. Browder; if not, I thank you very much. The next is Turner W. Battle, North Carolina Wildlife Federation, from Rocky Mount.

Mr. Turner W. Battle: Gentlemen, the people of North Carolina are concerned with our wetlands and estuaries. Just recently a very energetic - and what we hope will be an effective organization was formed in North Carolina called "WET". This is an organization whose initials stand for "Wetlands and Estuaries for Tomorrow". This organization has recently affiliated with the North Carolina Wildlife Federation and I felt it was appropriate to let them express their opinion to you and they prepared a statement. Their President, Mr. H. E. Harrison, Jr., of Plymouth, North Carolina prepared a statement which he asked me to present for our affiliate organization. His remarks are fully enforsed by the North Carolina Wildlife Federation. I asked him to present to me a statement to be approximately five minutes but when I read his statement last night in my motor court room I found out that he writes about four times as fast as I speak; so, I'm not going to take the time to give his full report. I'm going to attempt to paraphrase it as quickly as I can, hitting the high-lights. I filed a complete statement with your staff at the back of the room and also certain addendum material. His statement paraphrase is as follows: (Rather than transcribe the statement as paraphrased, following is a text of the complete statement as filed with the study commission)

"Gentlemen, on behalf of Wetlands and Estuaries for Tomorrow, let me express my appreciation for the privilege of being allowed to present to you, through Mr. Turner Battle, the following comments relative to the conservation of our estuarine resources.

No informed discussion of the estuarine resources of North Carolina can take place among men who are not familiar with the information contained in two important recent publications: (1) PROCEEDINGS OF THE INTER-AGENCY COUNCIL ON NATURAL RESOURCES:, November 21, 1967, and (2) A COMPREHENSIVE ESTUARINE PROGRAM FOR THE STATE OF NORTH CAROLINA, a report prepared by the Estuarine Study Committee and presented to the Inter-Agency Council on Natural Resources in May of 1968. Both of these publications are available on request from the Division of Sport and Commercial Fisheries of the North Carolina Department of Conservation and Development. I know of no other place where so complete an accumulation of up-to-date information relative to the state's estuarine areas is available in condensed form. These two publications are, I believe, the definitive ones and I assume that all of you are already familiar with them.

In the event that no copies are available for reference here today, I have appended to my statement copies of each. I have further appended 5 relevant articles from WILDLIFE IN NORTH CAROLINA, the official publication of the North Carolina Wildlife Resources Commission! I will not read either of these, but have included copies of them so that you may study them at your leisure.

Since there is very little which I could say about estuarine resources which would add to the information contained in the two reports from the Inter-Agency Council on Natural Resources, I would like to use the time which you have made available to me to editorialize briefly and to clarify the attitude which Wetlands and Estuaries for Tommorrow takes toward estuarine resources.

Someone once said that 'a politician thinks of the next election; a statesman of the next generation.' Each time I see the Commissioners of one of our coastal counties rush headlong into a marsh drainage project; each time I hear a representative of a 'conservation' agency speak of a natural resource in terms of the industry which can exploit it; each time I read the promotional accounts of another 'vacation paradise' which has been gouged out of a quiet marsh, I wonder just how many of our public officials are politicians and how many are statesmen. Each time I strip a slimy handful of wood fiber from my fishing line and, in disgust, pack up my fishing tackle, I wonder where our statesmen are. Each time I see a raft of fish drifting belly up on a polluted river, I wonder where our statesmen are. Each time I see another of those ugly orange signs erupt like a boil on the face of our coast to warn us 'Polluted Waters, Shellfishing Prohibited," I wonder where our statesmen are.

If you think I am the only one who wonders where our statesmen are, just look around you. Count the number of organizations which concerned individuals have formed, like bucket brigades, to fight pollution and waste and destruction of our natural resources in this State and across the nation. Look at Ducks Unlimited, look at Wetlands and Estuaries for Tomorrow, look at the hundreds of Wildlife clubs which make up the State Wildlife Federation. All of these organizations have been formed by men and women with a common interest: conservation of our natural resources. All of them are against the pollution and waste and destruction which is sweeping across the natural resources of our land like a rampaging fire. Each of these organizations is a bucket brigade fighting this fire. But bucket brigades are not enough; they can only supplement the efforts of a trained and organized 'fire department' established and directed by the government.

If you think I am the only one who believes our government conservation agencies are sometimes directed more by politicians than by statesmen, you should spend one Saturday afternoon at a crossroads country store. Squat in the shade of the inevitable China berry tree and listen. Ask questions if you like. You will find that most of the men gathered there have more than just a passing interest in natural resource conservation. The information available to them may be limited to an intimate knowledge of a short stretch of the nearest river, their understanding of conservation problems may be likewise limited and they may not be as articulate as the professional phrase makers whose oiled and polished metaphors excuse the political and economic expedients of our day. But in brief and pointed comments, which most of you will readily understand, they will tell you that they are concerned about our natural resources -- both for today and for the next generation.

Please do not misunderstand me. I am not saying that all government agencies are manipulated by politicians; I am not saying that the government has neglected its role in the conservation of our natural resources; and I am certainly not suggesting that any cane pole fisherman knows more about conservation than a resource agency biologist.

However, I am saying that I think, and that a great many hunters, fishermen and other sportsmen think that the efforts of both State and Federal Government have, to date, frequently been insufficient.

If the old saying 'an ounce of prevention is worth a pound of cure' has ever been true, certainly it is all too true of today's conservation needs. Unfortunately, however, many of our agencies are administering not the ounce of prevention, but the pound of cure -- and in many cases 10 pounds of cure would not be enough, nor 100 pounds.

Most of us are aware of the multiple problems which any natural resource conservation agency faces. Most agency heads, if asked to list their problems, would probably begin the list with 'insufficient funds' and end it with 'not enough money.' Certainly the financial needs of our conservation agencies are great and most of us are aware of the complexities of government budgets and of the struggle for funds. Too many times, in the past year, the past five years, the past 20 years, when the cookies were passed out, our conservation agencies have been last in line and have received the crumbs.

If a fire should break out in Croatan Forest this afternoon and sweep, uncontrolled, toward New Bern, the citizens of this town, the City Council, the Fire and Police Departments and the concerned State agencies would all drop the work at hand and turn out to fight the fire which could destroy their property and their lives. If the threat became more serious, it is possible that the Governor would call out the National Guard and request help from nearby military bases. Application for emergency assistance would be made to the Federal Government and New Bern might be declared a disaster area. We all hope this never happens.

But, gentlemen, a fire has broken out. It has been burning for a long time and our efforts to extinguish it have been little more than puny swats with a damp gunny sack. Now, it is nearly out of control. As we sit here today the Neuse River is figuratively burning, and with it Pamlico Sound and the wetlands and estuaries which surround it. And with them the Cape Fear River and the Alligator River and all the rivers and sounds along our coast. Again, I refer you to the findings of the Estuarine Study Committee of North Carolina's Inter-Agency Council on Natural Resources: In the past 15 years 28.5% of our coastal salt marshes have been altered by ditching, dredging and filling operations alone. Although statistics describing the physical alteration of our marshes are available, no comprehensive studies have been made which indicate how much insidous damage -- yet undetected -- has occurred as a result of chemical and other types of pollution.

The total damage already inflicted on our estuarine resources cannot be cited statistically, but those of us who hunt and fish in these areas know the damage is great. Those of us who go there seeking food for our souls just as much as those of us who go there seeking food for our bodies watch the source of our harvests diminish, and we are troubled.

You asked that I express my opinions on 'optimum use of estuarine resources, their value, damages incurred due to estuarine pollution and how the estuarine resources should be managed.' I think I have clarified my feelings on damages incurred due to estuarine pollution. Just to be sure, let me state it simply: the damages which we have already inflicted on the estuarine resources in North Carolina are disgusting in scope and reflect an attitude which borders on criminal negligence. With all our sophisticated technology, our 'progressive' civilization, and our astounding sources of power, we are little more than a nation of barbarians despoiling all that we touch and touching everything within our reach. We have learned to subdue the earth and to extract from it food and fiber and mineral to suit our needs, but I fear that we have not learned to respect the earth -- but respect it we must if we are to survive.

The value of our estuarine resources? I have seen reports which indicate that some of our estuarine areas produce more protein per acre than our best farm lands. Well, how much is an acre of prime farm land worth? But we can't really use that as a guide, can we? We could never farm an estuary. Why don't we contact a local real estate developer and price an acre of marsh along a developing waterfront? If we take his sale price as a guide we might conclude that estuarine acreage is much more valuable than any farm land we've ever seen. On some parts of this very coast a 50' x 150' lot dredged -- perhaps illegally -- from the bottom of one of our sounds and piled on top of a choice bit of marsh sells for as much as $5,000. On the other hand, if we do not allow developers to alter the marsh, if we simply ask the going price of undeveloped marsh, it may sell for as little as 20 to 30 dollars per acre. The value of marshlands and of all estuarine resources depends -- like most values -- on the law of supply and demand. At the present time the supply of marshlands is quite limited, but there seems to be no limit to the demand for this property. Yet, I think I can safely predict that we in N. C. have hardly seen the beginning of just what the demand for waterfront property will be in a few years.

Just what, then, is the value of our estuarine resources? I have not really answered that question, gentlemen, nor will I be able to answer it in dollars and cents terms. Let me ask you what is the value of two hours alone, on a cold November morning, in a blind you have built yourself, with a gun long familiar with, to your hands? Let me ask you what it is worth to see a flight of mallards swing out of the sunrise, beat up against the wind, set their wings and drop in your own special pothole? How much is it worth to us to be able to sit down to a well-spread table loaded with fresh oysters and bowls of steaming clam chowder? What value can we place on a 25 pound fish -- 50¢ per pound in the local fish market or $50 per pound which a good many sportfisherman might be willing to invest in the same fish? What is it worth to anyone of us to be able to hear autumn come in with the first big flight of Canadas? Let me ask you, gentlemen, what is it worth to anyone of us to be able to enjoy these things and what is it worth to us to insure that our children and our grandchildren shall enjoy them? Only when we have answered these questions, we will know the value of our estuarine resources, for their true value must be measured not in square feet of building space, not in pounds of fish for the market, not even in the number of recreational facilities which they will support; their value must be measured as we measure ourselves. Henry Thoreau once said, 'In wildness lies the salvation of the world.' I believe he was right. When we no longer value the freedom of the wary black duck, when we no longer care about the color of a sunrise, when we no longer are willing to fight for the rights of a stripped bass to feed and to spawn and to pursue its life according to its nature, then we no longer value wildness and freedom in ourselves. When this happens our concrete encased spirits will no longer care if the air we breath and the water we drink and the food we eat is tainted with our own wastes. I hope this day never comes.

If we are to forestall this dark day, we must immediately take steps to properly manage our estuarine resources. Toward this end, Wetlands and Estuaries for Tommorrow has already passed a resolution which supports the recommendations of the Estuarine Study Committee as a step in the right direction.

We hope, first of all, that the State and Federal Governments will establish agencies whose sole function will be to safeguard our estuarine resources and to oversee their proper management.

We hope, secondly, that the State and Federal Governments will understand from the beginning that these agencies cannot operate unless they are properly funded. A number of suggestions for financing estuarine conservation have been outlined in the Estuarine Study Committee's report. Additional sources of revenue will probably be suggested as our estuarine problems are studied in greater depth.

Third, we hope that the State and Federal Governments will initial land acquisition projects as soon as possible.

We further hope that, as soon as these lands are acquired, trained personnel in the appropriate agencies will be encouraged to institute planned management programs which will protect our estuarine resources while allowing maximum human use.

Certainly we do not want to ban men from the sounds and marshes, nor do we believe all estuarine areas should be preserved in their present state. We do believe, however, that substantial portions of these areas should be set aside for the public of today and for the generations of tomorrow. We believe that all estuarine areas should be classified and managed according to their best use -- much as a city is zoned for residential, industrial and other purposes. Certain estuarine areas should be designated for housing, other areas for industrial purposes, other areas for recreational development only and still other areas should be preserved in their present state and protected from any alteration whatsoever. Through a planned system of classification -- and I cannot emphasize the term 'planned' too much -- we can derive the maximum resource use with the minimum resource.

Fourth, we further believe that strong Federal regulations to control the application of pesticides should be enacted. We can no longer afford to allow the indiscriminate use of these dangerous materials by anyone with money enough to buy them. We believe these materials are beneficial to man and necessary to today's specialized farming techniques. However, it seems apparent that the use of these materials has become so widespread and that their effects are so complex-directly and indirectly-- that only highly trained and qualified persons should be allowed to apply them.

Finally, we believe that stronger State and Federal water and air pollution control regulations should be enacted. We have made some steps toward water and air pollution control in North Carolina, but conditions on many of our rivers and in many of our towns indicate that we have not done nearly enough.

Even if we had had sufficient time to prepare a detailed outline of what we in Wetlands and Estuaries for Tomorrow consider the best use of each estuarine area in North Carolina, we could not have presented it in the brief time available at this meeting. However, I hope that I have at least made clear to you some of the broad concepts which we believe should be considered in a comprehensive estuarine program, and I certainly hope I have left no doubt in your mind as to our attitude toward the present estuarine program in North Carolina or our general attitude toward the conservation of our estuarine resources and of all our natural resources.

'A politician, gentlemen, thinks of the next election; a 'statesman' of the next generation. I hope that we shall soon see an army of statesmen positioned to conserve and protect our estuarine resources -- and all of our resources. I firmly and honestly believe the survival of our own species depends on it as much as does the survival of the smallest crustacean or the most fragile microorganism. Thank you.

H. E. Harrison, Jr.
President
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[1] Allen, Durwood L., 'Natural Resources and the Expansionist Philosophy,' XXXI, No. 10, October, 1967, pp. 4-7 and XXXI, No. 11, November, 1967, pp. 4-6.

Davis, Chester, 'Waves of Development Threaten the Tidewater,' XXXII, No. 3, March, 1968, pp. 4-7

Florschutz, Otto, Jr., 'Multiple Use of Salt Marsh Impoundments,' XXXI, No. 11, November 1967, pp. 12-14;

Shuster, Carl N., Jr., 'The Nature of a Tidal Marsh,' XXXI, No. 7, July, 1967, pp. 4-7 and XXXI, No. 8, August, 1967, pp. 12-13;

Wallace, James C., 'Our Changing Environment,' XXXI, No. 6, June, 1967, pp. 6-12

Mr. Turner W. Battle: That concludes his statement. I was privileged to fly on the flight yesterday over our coastal areas and we observed recent industrial development, navigation and harbor improvements, natural erosion and pollution, ditching and drainage. All are desirable with two exceptions: that of natural erosion and pollution. We feel in short that an inventory must be made of these resources and then proper coordination and planning, to ensure that essential marshlands will be preserved. Thank you.

Colonel Pickett: Do any members of the panel have any questions to direct to Mr. Battle? (None indicated) I have the usual one; do you have any suggestions as to how this State plan for the use of the estuaries might be evolved; should it be a Federal or State, or a combination?

Mr. Battle: Personally I am a State's Rights man and I would hope that we would be able to handle this within the State of North Carolina. I'm confident that if the various Boards of County Commissioners of the coastal area would form some type of joint cooperative organization to properly handle this planning and management of these resources on a long range basis with the help of the State of North Carolina, and with the guidance and advice of the Federal Government, that this could be accomplished.

Colonel Pickett: Thank you, sir. The next statement that we have from my list is Mr. Elmer R. Daniel of the Tar River Basin Development Association. If there are any who need to present your statements quite early, if you can't remain until later, if you will let us know, we will try to reschedule them.

Mr. Daniel: Mr. Chairman, my name is Elmer R. Daniel. I am President of the Nash County Farm Bureau and also Vice-President of the Tar River Basin Development Association.

It is my understanding that this public hearing is being held to explore and identify problems of North Carolina coastal waters and what should be done to protect these valuable resources. My remarks more specifically will be directed toward the Tar River and its tributaries. Tar River originates in Person County and winds its way through a rich agricultural section and empties into Pamlico Sound. Agriculture is one of the largest industries in the basin.

We realize, of course, that the pollution of rivers and streams is of great concern to all of us because many municipalities obtain their water supply from streams and rivers and also these same streams may furnish irrigation for farm crops.

The use of chemicals for both agriculture and industry is necessary to maintain and develop the economical potential of our area. With the change in methods of production and shortage of farm labor, farmers today must use chemicals on almost every crop that is planted in order to produce farm commodities at today's competitive prices. I am pleased to report that thus far the use of chemicals in agriculture produced here has caused no problems in our streams.

However, I feel that adequate research must be continued on all chemicals as to their hazardous effects on run-off, those chemicals now on the market and those scheduled for release. This, of course, will determine their detrimental effects to our streams and rivers.

It may be necessary to review present legislation related to the use of water pollutants. Adequate regulations must be developed which protect the users of chemicals as well as the users of water.

Now, for the estuarine zones of our coast line. This is somewhat of a complex problem. This requires examination by ecologists. It has been said that the shallow edge of the sea where the salt water mingles with fresh water, commonly called the estuarine zone, is the most productive acreage known to man. It provides food and sport, moderates our weather, and protects us from the weight of a storm-driven ocean. Yet these same lands are abused.

The people of the State can best achieve the proper utilization and control of water resources of the state through the development of a well-balanced, coordinated and comprehensive water resources policy and plan. I thank you.

Colonel Pickett: Thank you, Mr. Daniels; do any members of the panel have any questions? (None indicated) We have another statement from Mr. Robert R. Monte, President of Craven Rendering Company, which he would like to have read into the record.

Mr. Jensen: His statement is as follows:

"My name is Robert Monte. I own and operate Craven Rendering Company. A brief description of my business would be that I process animal tissue and bone that is inedible, into cattle, hog and poultry feed. It is a smelly, dirty hot business all year long. It is an essential service required by packing plants and farmers to dispose of waste animal products.

We have cooperated fully with the State in regard to water and air pollution. We know that this is to our advantage both financially and in public relations. We would also like to thank and express our appreciation to the Stream Sanitation Board for the assistance and help they gave us in solving our problems as economically and practical as possible.

We do not believe that any new industry, existing industry or municipality should be allowed any longer to pollute and otherwise render unfit for human enjoyment our natural resources. It has been almost twenty years I know of that water pollution studies and controls have been discussed, proposed and acted upon by various governmental agencies. Surely in all this time people in responsible positions knew they had to do something about their own stupid disregard of public health.

The common cry is cost and we haven't the money. This in essence is a lot of foot dragging and hog wash. Industry would not be in business if it weren't making a profit, and a good business will use a portion of its profits for improvements. In the case of municipalities, they have been offered financial aid and assistance by governmental agencies to accomplish what is needed for their areas.

The people that object so strenously to clean air and water are usually those that need it the most. The short sighted approach to the problem tells them they cannot turn a fast buck or a quick vote out of sewage treatment. This may be so, but over the long pull they will realize more for their money in reclamation, and recreation than the original costs.

I believe that if acts or laws on sanitation are not enforceable, they should be made so and immediately enforced.

I also believe that all streams and rivers that are accessible to the public should be suitable for the use of people. Our streams should not be classified in any manner but fit for human use. Thank you.

/s/ Robert R. Monte."

Mr. Jensen: Thank you. Our next statement that we have scheduled is by Mr. H. A. Smith, the administrative officer for the State Soil and Water Conservation Committee, Mr. Smith --

Mr. H. A. Smith: Thank you very much. My name is H. A. Smith. I am Administrative Officer for the State Soil and Water Conservation Committee of the State of North Carolina. We are directly concerned with the activities of the 88 Soil and Water Conservation Districts which completely embrace all of the land area of the State, including the coastal counties most involved in the pollution problems of the estuarine areas of the State.

The historic role of Soil and Water Conservation Districts has been to stop erosion. The direct motive was to retain topsoil on the land for agronomic purposes. An indirect motive was to reduce sedimentation in our rivers and streams. The success of the Districts' program in this regard during the past 30 years, working in harmony with the Soil Conservation Service and other agencies, has been tremendous. However, the job is not nearly complete. All actions by Districts to assist individual landowners with erosion control and sediment reduction will materially benefit the restoration of clean waters. This is as true of upstream areas as it is of coastal areas.

Sediment is one of the largest contributors to water pollution. Every 1,000 tons of sediment robs the land of 25,000 pounds of plant nutrients. At the same time it fills stream channels, irrigation canals, farm ponds and reservoirs, destorys fish habitat, and makes treatment for municipal and industrial water unnecessarily expensive.

The small watershed program is another vital concern of the State Committee that affects a clean water program and an estuarine program. Two primary purposes of the small watershed program are flood prevention and sediment control. Sediment control is accomplished in two ways. Small dams are designed to form a sediment pool and accelerated land treatment measures tend to stop sedimentation at its source.

P. L. 566 projects in the coastal and coastal plain areas tend to be drainage projects. Some will contend that drainage projects are injurious to estuaries. This would be true in true estuaries. Most drainage projects are and will be on higher land. Mitigating measures for fish and wildlife habitat can be built in the projects. Such projects also carry with them the accelerated land treatment measures to reduce sedimentation.

Legislation on the Federal level to include water quality control purposes in small watershed projects is being actively sought.

Today's Soil and Water Conservation District has far broader interests than the historic interest in erosion control. Recreational development, wildlife enhancement, proper land use in industrial and urban areas, sanitary land fill, surface mining, long range land-use planning, and other aspects of our technological society concern the Districts today. Pollution abatement from any of these sources is compatible with the Districts' philosophy of promoting the wise use and management of all of our renewable natural resources.

Strong public support and adequate funding for Soil and Water Conservation Districts, for Federal and State assistance to Districts, and for the small watershed program including expanded authorities, will contribute to clean waters and wise use and management of the estuaries by attacking the problem at one of its major sources. I thank you.

Mr. Jensen: Thank you, sir; are there any questions from the panel? (None indicated) Mr. Smith, I have one, in Oregon we were told in a few years there would be no estuarine problems; would you want to submit anything for the record to indicate the sedimentation problems in North Carolina?

Mr. Smith: I do not have any concrete data to submit. I do know that in spite of the great efforts that we've made, that we still have a great problem. I believe that sedimentation is the greatest pollutant of our rivers and streams and it appears to me we still have a lot of work to do before we have sedimentation to a desirable level.

Mr. Jensen: Thank you.

Colonel Pickett: The next statement I have on the list will be by David H. Howells, Director, Water Resources Research Institute, The University of North Carolina; Mr. Howells --

Mr. David H. Howells: Thank you Colonel Pickett and Senator Whitfield, and members of the panel. I am David H. Howells, Director, Water Resources Research Institute, The University of North Carolina, located on the campus of North Carolina State University at Raleigh, North Carolina. I have a brief statement which I will summarize even more than it appears here.

First of all I would like to welcome you, Mr. Jensen, to North Carolina. I have known Mr. Jensen many years and it was with great pleasure to see Commissioner Moore pick one of the very best people to come down to the Middle Atlantic Region and direct his program here.

Questions concerning the most efficient use of estuarine resources, their value, damages incurred due to pollution, and the way they should be managed cannot be adequately answered at the present time.

We don't know what proportion of the estuaries should be preserved in an undisturbed State; how much should be set aside for municiple use the extent to which dredging for navigation and small boat access should be permitted; what areas can be given up to developmental activities involving permanent loss; and the effects of mining, agricultural, and industrial wastes on estuarine aquatic life. Much research is underway but more is needed. In saying this, however, I am not suggesting that a moratorium should be declared on use of the estuaries until the research answers are available. We know without study that water quality standards must be maintained. We can see the increasing tempo of developmental construction and the daily loss of estuarine marshes and waters to bulldozers and drag lines and recognize that we must begin to acquire and preserve areas needed to sustain the commercial and sports fishery, wildlife, and recreational opportunities in this developing region. We must recognize the importance of the estuarine environment to North Carolina and take action to prevent unnecessary loss, disfigurement, and degradation. I urge strong support of our Department of Water and Air Resources programs to monitor the quality of estuarine waters and control pollution together with the enactment of State legislation and funding of a program to initiate the acquisition of estuarine areas by the State. Concurrently, we must greatly expand the research effort to provide answers to the questions raised earlier in this statement if we are to set reasonable objectives for the management of these important areas.

The universities of North Carolina have already contributed much toward a better understanding of the State's estuaries, but vastly more remains to be done. Their research capabilities far exceed present utilization, and must be more effectively brought to bear on estuarine and other water resource problems of North Carolina . The Water Resources Research Institute was established to help further this objective. A new intercampus Marine Science Program has also been established within the University of North Carolina to strengthen educational and research capabilities with regard to estuarine and off-shore waters. In addition to on-campus facilities, The University of North Carolina has a number of laboratories in the coastal region devoted entirely to work of concern to this area. These include the Hatteras and Pamlico Marine Laboratories of North Carolina State University, and the Institute of Marine Science of the University of North Carolina at Chapel Hill. The Duke University Marine Laboratory, the Biological and Radiobiological Laboratories of the Fish and Wildlife Service, and the North Carolina Division of Commercial Fisheries Laboratory complete an imposing list of research facilities. The State's universities and agencies along with the Department of the Interior laboratories have accumulated much information concerning the quality of North Carolina estuaries. This, together with data being gathered through present research and study projects, should be very useful to the Federal Water Pollution Control Administration in preparing its report on pollution of the nation's estuaries.

The Water Resources Research Institute publishes an annual inventory of all active water resources research projects - including those dealing with estuaries. The latest report will be available in about a month's time. Copies can be provided to all persons interested in knowing more about what the Federal and State agencies, private industry, and the universities are doing in the way of research on estuarine and other water resource problems of North Carolina.

An important function of the Water Resources Research Institute is to focus attention on the water resources problems of North Carolina and to encourage and support research to provide solutions. It sponsored two research conferences dealing with North Carolina's estuaries - one on estuarine ecology and one on hydrology, in 1966 and 1967 respectively. Copies of the proceedings of the latter conference are still available upon request to the Institute.

During the past three years, the Institute has supported seven research projects involving estuarine ecology, hydrology, pollution control, and eutrophication. Three of these are still underway and additional projects will be commenced as funds become available.

It is my recommendation that the Federal Water Pollution Control Administration take full advantage of all information available from other Federal and State agencies and university investigators relative to past and present studies and that it then utilize the universities to the maximum extent possible to carry out such additional studies as may be necessary to attain its objectives.

Should the Administration's report to the Congress include legislative recommendations, it is my hope that these will provide for maximum responsibility at the State level consistent with regional and national interests.

Colonel Pickett: Does the panel have any questions? (None indicated) Mr. R. Bruce Salley, from Charlottesville.

Mr. Salley: Well, Mr. Jensen stated there would not be statements from us.

Colonel Pickett: Next on the list is Mr. E. B. Garrett from the State Grange.

Mr. E. B. Garrett: I am E. B. Garrett and I'm happy to bring you greeting from Mrs. Caldwell who is Master of the North Carolina State Grange, who was unable to attend this meeting. She sends her regrets. I've filed her statement with the committee out there and with your permission I will read this short statement:

"The North Carolina State Grange has had a continuing interest in pollution control for many years. Through its local, State and National organizations, it has supported legislation to cover all phases of this problem. The Grange has had a particular interest in the Soil Conservation District program and its effort to bring about a planned program for the best use and treatment of our natural resources. The North Carolina State Grange has worked closely with the State Soil and Water Conservation Committee, the State Association of Soil and Water Conservation Districts and local Soil and Water Conservation Districts. It is in the interest of what districts are doing in North Carolina to control pollution through planned land treatment that we have compiled these facts and offer this statement at this meeting.

Soil and Water Conservation Districts, established under State law in 1937, have had a tremendous impact on pollution abatement since their beginning. The 88 Districts in North Carolina cover all of the land in the State. The State law charges boards of supervisors with the responsibility for protection and development of the soil and water resources in their respective districts. Not less than five supervisors govern the district. These supervisors are laymen elected by the people. They are not permitted to hold any other elected public office.

District boards of supervisors have entered into a Memorandum of Understanding with the U. S. Department of Agriculture whereby agencies of the Department having an interest in resource conservation and development assist the districts with their program. The Soil Conservation Service of the USDA furnishes technical assistance.

In addition to agencies of the U. S. Department of Agriculture, districts have also entered into working arrangements with the North Carolina Forestry Division, North Carolina Wildlife Resources Commission, and the North Carolina Highway Commission. Several districts in North Carolina have also entered into agreements with agencies of the U. S. Department of the Interior.

Soil and water conservation district supervisors enter into cooperative agreements with land owners and users for conservation treatment on their land. Today 76,190 cooperators whose land covers 8,730,695 acres have on the land planned conservation practices that reduce silt, animal and other types of pollution.

It is estimated that about 25 percent of the silt from water erosion reaches estuarine areas. Land treatment practices that reduce or control the movement of silt from the farms of North Carolina contribute a major part to the protection of these areas. Examples of conservation practices on the land through the efforts of the Soil and Water Conservation Districts are:

Practice	Amounts	As Applicable - Acres Protected
Strip Cropping	93,590 Acres	93,590
Critical Area Planting	49,325 Acres	49,325
Vegetative Waterways	37,530 Acres	37,530
Pasture Planting	1,650,140 Acres	1,650,140
Tree Planting	422, 900 Acres	422,900
Terraces	46,750 Miles	561,000
Diversions	875 Miles	21,875
Ditch Bank Seeding	675 Miles	
Floodwater Retarding Structures	40 each	
Grade Stabilization Structures	1,949 each	
Farm Ponds	46,500 each	

In conclusion we would urge that any program for pollution abatement in estuarine areas include representatives from soil and water conservation districts. Districts have been charged by law with the responsibility for the protection of our land which is a principal source of pollution. They have demonstrated through the years that they are capable of carrying out this responsibility. We feel that no other group has done more to control pollution in estuarine areas than districts. We urge you to use them. We thank you."

Mr. Jensen: Does the panel have any questions? (None indicated) Next is Mr. Elmer D. Graham.

Mr. Elmer D. Graham: Colonel Pickett, Senator Whitfield and members of the panel I have a statement prepared by Mr. Charles W. Bartlett, State Conservationist and he sends his regrets that he could not attend this meeting:

"I am pleased to have the opportunity to comment on the work of the Soil Conservation Service, U. S. Department of Agriculture, as it affects water pollution and to emphasize the concern of the Service for the estuarine resources of North Carolina. We in SCS realize the immeasurable values of these resources as well as the imminent danger of damage by pollution.

Sediment is a major pollutant of the water in our streams and the source of the silt in estuaries and harbors. Some four billion tons of sediment are washed into tributary streams each year in the United States. The sources of this sediment are farm and forest land, urban, industrial and highway construction sites, roadbanks and other exposed areas. About one-fourth of this sediment is transported to the sea. The remainder is deposited on flood plains and in stream channels and reservoirs.

Sediment is a glaring example of a resource out of place. It hurts the land where it comes from, and it hurts the land where it goes. Sediment pollution is not only the highest volume pollutant, it is one of the most expensive. It causes other pollutants, such as chemicals, to enter streams which arrive there along with sediment and runoff water.

Sediment is not just a farm problem. In 1967 the Nation stripped an estimated 1½ million acres bare for housing developments, new roads, and other construction. Studies have shown that land undergoing development produces from 2 to 200 times the sediment in nearby farmland.

Substantial amounts of sediment come from the existing system of highways and secondary roads. Streambank and streambed erosion also contribute sediment which eventually ends up in the estuaries of the rivers.

Reduction of sediment damages through proper use and treatment of our land resources is a major objective of the Service. Public Law 46, establishing the Soil Conservation Service, states that 'it is the policy of Congress to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources, control floods, prevent impairment of reservoirs, and maintain the navigability of rivers and harbors, protect public health...' and directs the Secretary of Agriculture to effectuate this policy.

In North Carolina the Service programs of soil and water conservation are carried out in cooperation with 88 soil and water conservation districts covering the entire State. Objectives and efforts of the districts and the Soil Conservation Service are directed toward obtaining proper land use; controlling erosion and runoff; reducing floods, pollution and sediment damage; and otherwise improving the total environment through wise resource management. Some 76 thousand land users with 8.7 million acres in North Carolina are presently cooperating with soil and water conservation districts in planning and applying conservation measures on their land.

SCS administers USDA's upstream watershed protection and flood prevention activities as an integral part of the total soil and water conservation job. This involves working with local sponsoring organizations, including soil and water conservation districts and individual landowners and operators. Watershed work plans may include measures for watershed protection, flood prevention, irrigation, drainage, public recreation and fish and wildlife developments, and municipal or industrial water supply.

A major objective of the work done in watershed projects is to reduce flood water, erosion, and sediment damages. Land treatment measures, while providing protection to farm and non-farm land and producing on-site benefits, make a major contribution to sediment reduction. These land treatment measures are always an integral part and are essential to the success of any watershed project. Planned structural measures such as flood water retarding structures which have sediment pools, and properly designed, protected and maintained stream channels reduce the amount of sediment transported downstream. Presently, applications have been approved for assistance under the provisions of the Watershed Protection and Flood Prevention Act (P.L. 566) on eighty-four watersheds covering 4.8 million acres in North Carolina. Forty-nine of these, including 2.5 million acres, have been approved for planning assistance; thirty-seven, with 1.5 million acres, approved for installation of planned measures; and nine projects covering 187,858 acres have been completed.

The Soil Conservation Service has assigned responsibilities, in cooperation with other Federal and State agencies, to conduct studies of designated river basins and to prepare plans for the conservation, development, utilization and disposal of water in the basin area. These studies are concerned with management of both quantity and quality of water resources to meet present and future needs in the basin. The Service is presently participating with the State of North Carolina, U. S. Army Corps of Engineers and other agencies in a joint study of the upper tributaries of the Cape Fear River covering 4,450 square miles extending from Fayetteville to the upper reaches of the River drainage area. This study and subsequent report are scheduled for completion in 1970.

The quantity and quality of water which reaches the estuaries is, to a large degree, determined by land use and treatment upstream. As the technical agency of the U. S. Department of Agriculture charged with the responsibility of soil and water conservation, the Service has consistently emphasized this relationship. Two recent policy statements by the Administrator of the Service indicate the continuing concern for water pollution in Service activities. One of these statements prohibits SCS personnel from recommending the use of any aquatic herbicides, fish toxicants, fish anesthetics, fish therapeutics or dyes not cleared by the Food and Drug Administration for use in waters where fish may be used as human food. Likewise, SCS personnel are required to report observed cases of accidental use or misuse of pesticides and herbicides that might result in downstream pollution. Another recent SCS policy directive requires that all appropriate temporary and permanent measures be taken on construction jobs to prevent downstream sediment pollution both during and after construction.

In summary, pollution abatement is of major concern to the Soil Conservation Service. It is the policy of the Service to minimize soil erosion and water and air pollution in all its activities, including giving assistance to soil and water conservation districts and individual landowners and operators; planning and installation of control measures in small watershed projects; resource conservation and development projects; and cooperative river basin studies. The Service recognizes the need for close cooperation with all agencies that deal with matters relating to land and water use. In all our work with landowners, land managers and communities, we make every effort to encourage practices which reduce pollution and keep future sources of pollution from development.

/s/ Charles W. Bartlett
State Conservationist."

Thank you very much.

Colonel Pickett: Does the panel have any questions? (None indicated) I would like to recognize Senator Whitfield; would you like to make a statement at this time?

Senator J. Vivian Whitfield: Mr. Chairman and ladies and gentlemen, when it comes to telling a joke, I have told it so much, but when you get to talking about water, I'm kind of like the old maid who made an appointment with the doctor and he asked her what was the trouble. She said, "Doctor, can you catch a disease from a kiss?" The doctor said, "not likely;" says, "how long has it been since contact?" She said, "twelve years and 19 days, seven hours." The doctor said, "Why are you taking up my time with all this foolishness?" She says, "Doctor, I just love to talk about it."

When it comes to water I just love to talk about it in all of its phases. Of course, I've been in this game ever since 1945, and we're making progress all along the line. Of course we can't make it as fast as some and it's so slow for some, and so we just have to be patient. I want to read this and then I will make a few remarks. This is an estuarine matter. It says, "The nation's first service to help predict how rapidly river water pollutants will be washed out to sea has been launched by the Environmental Science Services Administration. This one year pilot program is being operated at the Penobscot River and bay estuary in Maine, but other Maine estuaries and some in other States may be added later. The Penobscot, heavy polluted from industries such as paper mills, was selected largely because Maine was the first State to show an initial interest in the program.

On the 3rd and eighteenth of each month the service will issue predictions on the rate at which potential pollutants are expected to pass through eight selected points along the estuary." That was in the Science News.

I read that and got on the phone with Senator Jordon to get me all the information possible about it because we would like to have one of those pilot plants on any river, and particularly the Roanoke, and I have a letter from him this morning stating that he was working on it and would get all the facts and would have to make formal application for such a program. I know that will please your department, sir, and we want it on the Roanoke because, well, my good friend Turner Battle got upset because he went there and saw some logs floating down the river. We have been working on that aquatic plant for a long time, and it gives us a lot of trouble. Turner says that, he's right, he said the average person that goes there and looks at it and sees how ugly it is. He doesn't care what the quality is down there. Now, we are maintaining the quality of it, see, but we can't help the looks. That is not our function. I think the wildlife people started a fine program about beautifying or cleaning up and dredging things, and getting things in good shape.

Now, Turner, there's a law on the statute books which says if a logging company or anybody cuts a tree in the river or a log they have to clean it up. Only last month I got a call that two trees had been cut down in our creek. I called the county commissioners and told them what had happened and the county commissioners immediately found out who did it and had it cleaned up.

Our function is to keep the quality of the water and not how it looks above; don't blame the Board of Water and Air Resources. Now, I could see why Turner was disturbed; you've got a pulp mill there and a textile mill and when you mix the textile mill with the pulp mill and he says it looks like worms and you've got resin and you're going to smell the resin and it stinks but that is a problem, as I say, we can't solve. Now, maybe somebody will come up with a solution to this. I wrote Mr. Joe Moore in connection with this last week. In fact I talked with him when I was up there two weeks ago, when we were there discussing our standards and I says, "that is a big problem." He said he knew it was and he agreed with me he thought the Federal Government could do nothing better than have a research program on aquatic plants.

Last year we had a fish kill near New Bern, south of New Bern, east of New Bern. Well, we thought that was coming from the City of New Bern or Frosty Morn; you know what it turned out to be? Poison from an aquatic plant. So, all the fish kills aren't done by industry or municipalities. While I am on the fish kill subject, let me say this: you read in the morning paper we have solved the big fish kill down my way on my creek. They have a joke down there that it looks like they would have spared Whitfield Creek - anyway of all the creeks they had to select mine and my river; everything is fine and there was a mighty big fine, $15,800.89. Well, that's what it was. The wildlife people did a magnificent job in this undertaking in classifying the fish. They had fifty men down there. You would have thought it was Jersey City or Newark in a riot there were so many officers down there, but they did a very fine job and we thank them for it, and in behalf of ourselves and for the State. You see back in 1963 they had a big rockfish kill over on the Roanoke. They decided so far as we thought it was endrin, and we knew that J. P. Stevens and Company made a cloth in which endrin was used and we lost two days in trying to pin it down on them. It was made at Cheraw, South Carolina, and we found out from the pulp mill there that a valve blew off and before they could stop it, 11,200 gallons of that had killed all those fish all the way down. They finally stopped it but we had no law, but, of course that brought us about, brought us down to the fact that we had no law and in the 1963 Legislature we got a fish kill law and we have a very good one. We wrote all over the nation getting fish kill law data and all, and finally wrote down one of our own using some of Virginia's law; California's law was so strict that they had never been able to get a conviction. When it comes to fish kills, you're going to have them and there's nothing we can do. Sometimes we get critized for that. I know the gentleman at Wallace, a high grade man; it was ignorance. He didn't know it was toxic, he was cleaning out his warehouse and hadn't sold any for a while and he got rid of it and that was the way it was, and he has to pay for it.

You saw in the paper week-before-last where a student working for the Western Hatchery put the wrong chemical in and killed all the fish in the Western Hatchery. Once in a while somebody deliberately poisons some of the fish but most of the time this is accidental, and whether we like it or not, whether the press likes it or not, that's the way it is.

Let me just make this report while on the coast here. We are very happy to report that two things of importance happened this year of 1968. Beaufort, North Carolina has finally got enough money, after 13 years, to put its house in order and that means that 5,800 acres of the finest shell fish grounds on the Atlantic coastline, within two or three years will be opened to everybody. Look at what it's going to mean to the economy of that area. The Department of Health will withdraw its condemnation. Week before last we appropriated or gave Wilmington nine hundred and some thousand dollars to get its job on the Cape Fear done. It will take about two or three years, and Buzzards Bay at the mouth of the Cape Fear will be free of pollution and the shell fish will be available for the market.

So you see this problem of cleaning up the streams and keeping them clean is a tremendous job.

Now, the paper the other day, I think, gave an impression that I was against Federal money for these grants. Well I worked hard to get Federal money for grants, but I disagree in this respect: I think the State should put up a part and the time is coming when, if the State doesn't, then the State will not get a grant. We asked the Legislature in the last general assembly for a million dollars, to help the cities and municipalities who couldn't do the job. Well, they couldn't see it. We asked the next Legislature for two million for each year of the biannum and I hope you gentlemen will tell the Legislature the time has come to act. We're doing our job. We have got quite a few cities that have done everything we told them but some are waiting and can't move for the simple reason they don't have ample funds. They have to get permission from the local government before a bond issue, and their indebtedness is so high it's a difficult matter; so, there you are. It takes money to make the thing work and it takes money and plenty of money. Since we've been in business since 1951 we have spent $230,000,000 in North Carolina for stream sanitation. Now, the whole coast will be clear as soon as Wilmington completes its treatment plant in about two years and Beaufort except, Mr. Jensen, except Camp Lejeune. Are we going to have to sue the Federal government? Are we going to have to sue the Federal Government?

Mr. Jensen: I'll refer you to Mr. Gardner

Senator Whitfield: Everytime the Federal government says this, that and the other; please give us some money. Make a note of that and tell them about it. So, we're moving along. Just give us time and we're not going to move as fast as we ought to because you can't spend a half a century and then press a button and do it.

I want to talk about non-degradation. We were up, talking to Mr. Jensen several weeks ago about Mr. Udall's non-degradation decree, which means that certain streams at certain times, we have to get their permission in regard to lowering the classification, if necessary. Well, that, in my opinion and others would slow down industry, industrial development. What I do object to is simply this: stream sanitation has been free of Federal intervention and it can stay so. We have called on the Federal government many times to cooperate with us and we can do it without a law; we have done it. The Champion Paper Company seems to be the whipping boy because it came down here in 1909, got a choice site on the river and proceeded to pollute it until 1958, and still pollutes it to a certain extent, but it came under our jurisdiction in 1958. They have done everything we told them to do. They have laid the primary foundation and now on the secondary foundation. They spent over four million dollars to get the primary foundation and it is going to cost them five million dollars in two or three years. Now, some folks, even one paper stated that we were scared of industry; that we favored them because Governor Moore used to be their lawyer and all that kind of mess. We're not afraid of anyone and never have been and they object to the fact that they never have been to court, never have had them in court.

We take the position that as long as we can clean up our streams and that people of good will can get around the conference table and settle their problems. We've done that; you let them volunteer to do it. We ask them if they are going to do it without intervention and they yet have had to intervene, and these things move very slowly, and you just can't press a button and do it.

I want to give you this little chat to show you what we're doing and what we're going to do. If we can get the money our streams will be in mighty good shape between 1973 and 1975. No crystal pure water. I said no more crystal pure water. I said no more crystal pure water. I didn't quite say that in the way it was put. I said it's difficult, it's going to be difficult to find it. You can't have industry and find a lot of crystal pure water. There is a lot of water for the mountain trout up there and we classified various sections of every river and we've raised our standards and sent them up to Mr. Jensen's boss, Mr. Udall, and they have approved them except two or three minor ones and the degradation matters, but once the Federal government gets its foot in the door, you know it's a great temptation. It's a great temptation and they don't need to take over on interstate waters. They have certain jurisdiction now. Let's don't make another Department of Education situation; let's don't do that. We're headed in the wrong direction, if you don't mind. If you let the Federal government assume all the responsibility you are going to wake up one day with a military dictatorship and that's why the best way to stop a thing of that, it's best to stop a thing of that kind. Let's keep the clean-up of our waters for us to consult with the Federal government and call them in just like we did on the Pidgeon River; we called them in and other Federal agencies and we had a study there and they said what we had been doing was right; that we had been right and we can call the Federal government in at any time. This is team-work, not control.

It's been a pleasure to be here and just keep the water as clean as is possible. I use the term, "usable water;" that's what you'd better use and we are going to have our standards higher than ever. It takes time, so let's all work together to do the job that we started in 1945. It's mighty easy to sit in an arm chair in Washington and be a back seat driver or in Raleigh or anywhere. The man on the firing line that has the problem and I am a veteran of the firing line for 23 years. I have learned a hell of a lot; thank you.

Colonel Pickett: Next is Mr. Frank Turner, and I will ask him if he would like to make any statement, from the State Department of Administration.

Mr. Frank Turner: I had not counted on making any statement. I would like to say that the State Department of Administration is intensely interested in this subject that you're dealing with, as we have in the past and will continue to work towards the same end that you are working towards; thank you.

Colonel Pickett: Next is Mr. Edwin P. Davis, Exeuctive Director of the Professional Engineers Society of North Carolina.

Mr. Edwin P. Davis: Thank you, Mr. Chairman and gentlemen. My name is Edwin P. Davis, Executive Director of the Professional Engineers Society of North Carolina, a State-wide association of some 1,000 Registered Professional Engineers who work in Private Practice, in Industry, in Government and in Education.

As Professional Engineers and as concerned citizens of North Carolina, we are vitally interested in this program and would remind you of the wealth of engineering talents available in this State, all ready and willing to assume any role in the development and management of the respective programs.

The challenge of water quality and pollution control ranks among the major social and technological issues of this century. The path toward solution, no matter how many turns it may take, will touch on virtually every form of human activity from scientific inquiry to lawmaking, from economics to esthetics, from education to health care.

In a practical sense, we know that engineers will be called upon to carry great responsibility for pollution control simply because the elimination or abatement of most major environmental pollution sources is an engineering challenge.

Professional Engineers of North Carolina accept this challenge of making our State a safe and rewarding place for future generations. Thank you.

Colonel Pickett: Does the panel have any questions? (None indicated) Mr. Peter J. Hanlon, Southern Region, U. S. Forest Service, do you have any statement to make?

Mr. Peter J. Hanlon: No, sir.

Colonel Pickett: Courtney Mitchell, Jr., do you have a statement from the North Carolina Seashore Commission?

Mr. Courtney Mitchell: I'm enjoying this; thank you. Next is Howard T. Odum, Professor, University of North Carolina for Ecological Society of America, American Society of Limnology and Oceanography.

Professor Howard T. Odum: I am a Professor at the University of North Carolina with academic teaching responsibility along with some other members of these professional groups who are also in the audience who may submit any plans for the successful development, management, and regulation of estuaries of the United States must be consistent with the ecological and economic principles by which such systems operate with and without modern man. Because the systems of the water differ from the systems of the land in having moving fluid, the land laws do not provide for sensible management and new laws must be enacted to recognize the limitations and requirements of marine systems. With this statement, I represent scientific technical societies whose principal mission is the development of knowledge concerning these systems and whose professional responsibilities to their States, their Nation, and their ideals of true knowledge require as aggressive as possible an effort to make known to responsible civic process the scientific facts concerning estuarine management. The following principles are offered as pertinent:

1. Principle of the Circulating Body as Management Unit - An estuarine system receives its causal energy from three main sources: (a) the sun's energy that supports the plant food-making process that supports part of the living components; (b) the organic matter from the rivers which supports other living components; and (c) for forces of wind, tidal motion, and current which circulate the water and with the necessary chemical substances, the planktonic microscopic organisms that constitute the estuarine farms, and the gases, oxygen and carbon dioxide, whose even flow is necessary to all the chemical biological process of the estuary.

All these processes control the natural industry of the bay or the system of processes that develops when man puts in and takes out materials. Thus the phosphorus, nitrogen and other fertilizer elements necessary for the microscopic green estuarine crops of the estuarine farm are recirculated from the waste products of the body processes of the clams, fish and billions of plankton animals (water flea size). These biological systems support the aesthetic quality of the bays and their margins, regenerate wastes including some capacity for waste of man, (not too much), keep the bay systems with adequate oxygen, and because of their shallow character are nurseries where fisheries of the open seas make their fastest growth before going out to sea where they support commercial fisheries.

A farm on land stays put and one may buy or sell its productive essence. A farm in an estuary swirls with the water. If you had title to a piece of the estuary bottom, you should not have the essence of the bay since it is swirling and exchanging within its natural circulating unit. The first principle, therefore is that for management, planning, regulation, and development, no plan can succeed unless it first defines the estuarine circulating unit as the management unit. These units are sometimes defined by constrictions and bars in the estuary; at other times they are defined by the way the water behaves forming up and down circulation that is circular. These boundaries may be changed by building barriers, although making bays smaller may diminish circulation energies and thus diminish the power of the system to do its aforementioned industries.

For an example, take the Albemarle Regional Planning Program in North Carolina. Their maps show their boundaries right across a marine bay as if it was a piece of still land. This is absurd, because any planning done on one side of the bay will be negated if something contrary is done to the same circulating water on the other side of the bay. It is possible to zone marine waters but only if natural units or man-made circulatory barriers are used. The new laws must allow possession or authority over units of system circulation if they are to be scientifically sound. For those systems, which export and import shrimp, crabs, and food fish to the open sea, there must be provision for management of these together. Thus, the subsystems are tied together into larger systems.

2. Principle of Return Payment to the Estuarine Systems - It is a taken-for-granted principle in the economy of man that payment is made for goods and services and that such flow of currency allows each industry of the economy to maintain competitive survival. No person or industry is asked to provide some of its production for nothing since this would cause it to be competitively excluded. The principle applies to the management of natural systems. Man receives the yield of aesthetic recreational restoration, foods, services in processing wastes, and other profits from the bay system and its components. If we draw on these systems without returning some exchange of special value to the estuary, we cause the aspects in which we are expecting continued yield to be diminished. A formula must be derived by which services of bay stimulus, management, and encouragement, such as encouraging desirable fish food chains, should be returned to the bay in proportion to the dollar yield from these bays. Such programs will insure that the bay becomes part of the economy of man and nature rather than a mining operation which soon is of no further use to sustain a viable coastal basis for human development.

There are precedents for this kind of program. For example, some of the Federal laws provide monies back to stimulate sports fishing in proportion to the monies derived from licenses to take fish.

3. Principle of Compatible Use and Estuarine Barrier Zoning - Because of the mixing aspects described above, an estuarine unit is defined by the circulation of water and minerals. Plans for use must separate and combine users and uses so that no incompatible uses are operated in the same bay. Thus shipping, bilge waters, poisonous copper bottom paints of ships, industrial wastes, and continuous dredging are not compatible with aesthetic, fishing, food, and purification aspects and should be isolated by barriers so that the waters do not mix. The new hot water power plants because they take the life out of the water that passes their systems and thus in effect destory the old type of estuarine farm, may be compatible with the industrial uses but not with the aesthetic-biological ones. The values for

the bays are large, for example, nearly $400/acre per year in Corpus Christi Bay (Texas) in 1960. No one use claims a preponderance of this value. Proper management will allow some systems for each purpose. The biological aesthetic ones require large areas of sunlight as do farms. The industrial ones can be concentrated in small bays and channels in the same way that industrial cities are channeled. Water from one must not be circulated into the other.

4. Principle of Sea Farming at Least Cost - Partly because of the history of competition of sports and commercial fishing, partly because legislators believe that little fishes if left to grow would survive to become as many big fishes, and partly out of tradition, all kinds of restrictions are placed on the framing and harvest of the waters, which would seem absurd if placed on the cattle farmer. The way to control overgrazing is to control the amount of grazing, but not to raise the costs of the grazer. If a body of water system is assigned to food production, it needs to be managed for its maximum yields of food or sports fishing pleasure. Estuarine zoning may set up in one bay for sports fishing and another for commercial fishing. Where food production is intended, enough title to that bay through long term lease or other device is required so that large capital ventures can be made in its management to include whole bay fertilization, stock management, bottom control, etc. The shallow seas can be farmed as water systems. Large bays will require large capital and methods should be proven on very small bays first. Our present system of common and incompatible competing uses is preventing the attainment of maximum values. Laws to allow management of the estuarine systems as units are required. Shellfisheries cannot be managed by themselves since their food is filtered from the estuarine microscopic farms (organic matter and plankton). The old bottom leasing idea ignored the water which must be managed with the bottom.

5. Principle of Complexity, Aesthetic Yield, and Water Purity - Where conditions in the estuaries are not severely shocked by changing water levels, salinities, floods, and other disturbances, some very diversified (in species) living systems develop which have great aesthetic value to the recreation industry and have associated clarity and purity of waters in part because of the complexity of life which is efficient at mineralizing many special chemical substances by virtue of its organismal specialization. There are the interesting coral reefs in tropical waters, kelp beds in Florida, intertidal crops in Maine, and grass flats in many other areas. The variety of fishes, or skin-diving pleasure, or scientific values cause these areas to be of special consideration since they are destroyed with disturbances. These waters are in the class of National Parks and need to be set aside in such a way that the waters that bathe these systems do not mix with the waters serving other uses where there is turbidity, industrial wastes, insecticides, etc. As freshwaters are dammed up stream more and

more, the floods to the estuaries in many places will diminish and these systems may develop in areas that previously did not have them.

6. Principle of Natural Estuarine Nursery - In the management of the estuarine margins, the importance of the marshes, the shallow underwater grassy bottoms, the shallow waters must be emphasized since this is where enough light penetrates and is concentrated to develop much of the productivity that supports food, sports, aesthetics, and ultimately cleaning power. The deepening of these marings and the dredging for small boat channels and waterfront bulkheads, essentially destroys these because the waters are then too turbid to exceed the light-food reaction property that scientists call the critical depth. The swirling estuarine microscopic farm is choked dead if the little green cells are in the dark too much of the time just as if you kept a black cover over a farm too much of the time. There are ways to have both marinas and nursery margins, such as by cutting marinas into new land, but never at the edge of the bay. For damage already done, regarding of estuarine bottoms to optimum production depth and restore productivities already lost. The cost of this may be included in channel development projects as a necessary payment back to the bay for the special service extracted.

7. Principle of Total System Management, Land and Water - The requirements of management of the circulating estuarine water systems are diverse and must be oriented towards many productive aspects of the economy. The past tendency for one user group to gain full control of a bay without due process and ruin it for other uses needs to be prevented in the future by placing regulation and development under a body which is charged to develop the water system. Presently the development of land systems without incorporating the water systems is a conflict of interest in which the public's rights are being given away as means for attracting industry. Since the States are competing for industry and since the destructive navigational satellite programs are Federal, some Federal action may be necessary. However, the actual development needs the kind of enterprise and development one associates with industrial-governmental-agricultural collaboration in terrestrial farming. State enabling laws are needed for full development of all the aspects of the estuaries. Regarding the bays as a development responsibility will go a long way toward making State boards of conservation and development do positive things to their estuarine resource instead of the current policy of encouraging their destruction, by permissive attitudes towards industries on land.

8. Estuarine Systems Study Project and Systems Definition Surveys - To facilitate the proper management of our estuaries, a group of scientists are defining the types of estuarine systems for a report to Congress as a contract with the Water Pollution Control Administration, sponsoring this hearing. Thus the kinds of systems in America are being summarized from the published literature, such as oyster reef-plankton support, Rangia estuary, Briny Bay, paper waste dominated bay, etc. What

is needed after that are Statewide surveys that define their estuaries by circulation -- including nutrient circulation as well as water circulation. Most States already have their bays well classified and measured in many other ways. Then planning commissions may recommend ways to identify the bays with compatible uses and find ways to implement guidelines for and positive developments for each compatible type. A percentage will need to be in public domain as are parks.

Colonel Pickett: Does the panel have any questions? (None indicated)

Senator Vivian Whitfield: If I may, the problem North Carolina will be faced with shortly is this: we are seeking industry and want more industry and it's understandable, but streams can stand just so much. We are not going to have a chemical complex at Wilmington or other places like at Charleston, West Virginia, and places like that. Now we work closely with the Department of Conservation and Development on sites and everything. The time will come if an industry wants to come, we feel like at a certain place, we will tell them they'll have to treat their wastes one hundred percent; if they can't afford to do that we're not going to have the streams of North Carolina put in a position like some of the other States have been. We want industry but not to destory your streams. You'll destroy our civilization and we're not going to have it. Some of our standards haven't been as high as some folks thought they ought to be in the past. We're moving up all the time; we're moving up our standards. Our big problem, of course, is money. Do you know that Colonel Pickett asked for 31 employees for his department last year, the last Legislature, and didn't get one. The Legislature wouldn't give him one. We asked for seven and we got, this is back before we were amalagated, we asked for seven and we got three. Now, we need monitors and more monitors. It's impossible with 52,200 square miles of river basin that were, that with five people to cover the State adequately; we get around and get to it but that's the problem, with monitoring and we're going to ask for it but not sure about getting it. This business is a very difficult and slow thing. You have to educate people. Why when I introduced a bill in North Carolina to introduce the Stream and Sanitation Committee, they said I ought to go to Dix Hill, couldn't get a committee to handle it, but public opinion began to swing behind me and in 1949, I got defeated on the floor of the House by eight and in 1951, it passed 98 to 14, public opinion, but people don't understand, particularly people out of doors. Thev want to do as they please.

The first thing I learned when I went to the Legislature in 1945, was never to introduce a dog bill or fishing bill. That's the first thing you have to learn if you have the wisdom of Solomon, and you go back home and see what the folks say. You can't interfere with that but gradually we're doing the job but I just want to say now as far as we're concerned with our present set-up, we're perfectly satisfied. We are working out our differences with the Federal people already There are nodifferences, except a few minor ones. The only thing we disagree on is degradation and we will call on the Federal government whenever we need advice. It's so easy for somebody to, who wants to swing his weight around to walk in and the next thing you know he's got his head in there. That's the trouble and I'm protecting you boys up there.

So we can go as partners. In 1956 we realized that our program was stymied because the counties couldn't do it, many of them. We went to work and got together with them and carried on a battle to get Federal grants. We asked for one hundred million and got fifty million. Mr. Eisenhower vetoed it. We persuaded the Congress to pass it over his veto, the same thing in 1957, 1958, and 1959. I wanted to relate those things to show you the battle you have to go through and all of a sudden we had a day of enlightment and it's been improving ever since, and what I tell them is this: tell Mr. Moore and all that the States are doing the job; the States that are doing the job, leave them alone, offer them advice those that want it, and those that won't you have to crack down on them. That's all there is to that. As a matter of fact you wouldn't have this law if all the States had done their job. You wouldn't have it, just the Federal government had to take over, but I think with a stern look and a warning in the eye, I think we don't need to get the foot of the Federal government in the door to do the job. From 1945, to 1952 we started to classify the streams of North Carolina, to second from the top in 1964 in monies expended by municipalities. That shows you what we've been able to do but it was with Federal money and I think the State has a right and the Federal government has a right to demand that. I'm not worried, Mr. Jensen at all. The reason we haven't written that letter that we told you we were going to write is that we had this fish kill on our hands and Mr. Hubbard had a week's vacation; so, you will get your letter by week after next. Thank you.

Colonel Pickett: The next on the list is Daniel A. Okun from the University of North Carolina. Mr. Okun -

Mr. Daniel A. Okun: I am Daniel A. Okun, Head, Department of Environmental Sciences and Engineering, University of North Carolina, Chapel Hill, N. C.

I am honored to be invited to present a statement at this meeting, as I feel that the protection and proper development of our estuarine resources are important to North Carolina and the Nation. Furthermore, I am pleased to have an opportunity to speak to representatives of the N. C. Department of Water and Air Resources and the Federal Water Pollution Control Administration, two agencies that have considerable responsibility in fixing the direction of estuarine development.

Estuarine waters occupy an important place in North Carolina, which has a general tidal shoreline of 1,030 miles, representing just 8 percent of the total shoreline of the 48 contiguous States. Among these 48 States, only California, Florida, and (by a slight margin) Texas exceed North Carolina in general tidal shoreline. Enclosed by part of these 1,030 miles of shoreline are more than 2,500 square miles of bays and sounds. Again, only Florida and (by a slight margin) Texas exceed North Carolina among the contiguous 48 States in area of enclosed walt waters.

As a result of the relatively low tidal range along the North Carolina coast, averaging 3-½ feet at Cape Hatteras and less than half a foot in Pamlico Sound, North Carolina's estuaries are less subject to natural flushing through tidal action than similar systems in other parts of the country and hence are more likely to be sensitive to pollution. Such pollution can originate through local activity, or it can be introduced upstream in the river drainage systems emptying into the estuaries.

An exhaustive study of estuaries is now being inaugurated under the direction of Dr. Howard T. Odum at the University of North Carolina Institute of Marine Sciences, under contract with the Federal Water Pollution Control Administration. This study identifies initially at least 10 different kinds of estuaries in this region of the United States. Furthermore, the hydraulics and metabolism of estuaries is much more complicated than those of other water systems, and evaluations of the significance of pollutional discharges or other manmade changes are very difficult to make. Each estuary presents its own distinct problem.

A wide variety of administrative procedures can be used to control pollution in our estuaries and to permit development of their full potential for the people of the coastal region, the State and the Nation. I do not want to dwell on whether this might best be done at the local level or through Federal dictate. Recognizing that the goal of both State and National administrators is the same, I feel that it is safe to assume that, in North Carolina, close cooperation between State and Federal agencies will ensue, once sound administrative policies have been adopted. That strong controls are necessary as the population grows, as industrial development accelerates and as technology provides more time for individuals for recreation and utilization of natural resources is obvious.

One approach to pollution management is to establish fairly rigid across-the-board regulations, such as "anti-degradation", which would apply to all "without fear or favor." Such an approach has the advantage that it is simple to administer and it requires little in the way of technical or administrative judgment, leaving little need for flexibility to meet varying circumstances. Another, not unimportant, advantage of this approach is that it satisfies the demands of the articulate conservationist segment of the public in that it creates an impression of regulatory rigor and vigor.

The other end of the scale is an approach which would adapt control measures to each individual set of circumstances. This has the disadvantage that the administrative agency would have to examine each area carefully before establishing water quality criteria and the kinds of control measures that would have to be adopted by cities and industries in the area. The regulatory agency would have to have a large and competent staff prepared to deal on an equal footing with the technical representatives of existing and potential water polluters of each city and industry. The agency would need to be able to defend the rationale behind its regulatory decisions. A further disadvantage of the approach is that it is slow as compared with administration by fiat. Its one great advantage, however, is that it encourages the most efficient use of resources for all interests in the State, both those who would use the water for municipal and industrial water supply, recreational development, waste disposal, or the extractive industries as well as those who would preserve the resource of wildlife or for academic study. It would strive to achieve an optimization of benefits and a minimization of costs in each locality.

To draw an analogy, the two administrative approaches described above would represent the difference between establishing a single specification for highway construction and operation, with four-lane divided thoroughfares and a 20-mile maximum speed limit everywhere, as contrasted with an approach that would adapt the highway design and the speed limit to the local situation. A universal, low, speed limit and four-lane divided highways in town and country might give the impression of assuring the preservation of more lives on the highway, but in fact it would encourage a disrespect for regulation and would cost so much as to be not feasible of implementation.

It is clear from the above remarks that I favor an approach that would require an examination of each estuary in each local situation before reaching a decision as to the water quality to be maintained, the development to be permitted and the pollution control to be adopted. This approach is consistent with past practice in North Carolina, as from its inception, the N. C. pollution control program, using a system of use classifications, has attempted to treat with each stream and each reach on that stream individually to arrive at optimum solutions for each locale in the State.

If pollution abatement has not proceeded as rapidly as we would like, it may be that the regulatory agencies have not had the manpower either in numbers or in training to permit intensive application of this individualized treatment of the problem. However, North Carolina and the Nation are not rich enough to afford not to invest in this kind of approach.

The cost of increasing the personnel resources of regulatory agencies is a small fraction of the benefits that would accrue from a rational assessment of our needs for resource protection. Regulatory agencies need the services of the best engineers, the best aquatic biologists, the best chemists and the best ecologists and economists to make decisions that are so important for resources development in the State and Nation.

We appreciate that it is difficult for regulatory agencies at the local and National levels to develop quickly the professional and scientific staffs necessary to exact the most efficient use of estuarine resources. Therefore, I should like to suggest that North Carolina, as the Federal Government and many other States have done in similar circumstances, utilize the resources of educational institutions within the State. At the University of North Carolina at Chapel Hill, for example, specialists in many aspects of estuarine management are found in the Departments of Zoology, Botany, Geology, City and Regional Planning and Environmental Sciences and Engineering, in addition to others. The University's Institute of Marine Sciences at Morehead City has long conducted studies of our estuarine waters, while the Water and Air Resources Research Institute of the Consolidated University has sponsored research in estuarine problems on its Raleigh and Chapel Hill campuses. In addition, the University has just appointed a Marine Sciences Coordinator, Dr. John Lyman, who will help to focus the attention of all elements of the University on marine resource problems.

Pollution, per se, is not the main problem facing those who would develop the full potential of our estuarine waters. Land development for housing, marinas, industry, etc., in the coastal areas, with its associated land filling, dredging, and spoil disposal, and concomitant changes in the hydraulic and hydrologic regimes in the wet lands, will only not increase the potential for pollution, but will if uncontrolled, make for irreversible, and often damaging, changes in our coastal resources.

It is clear that the State has professional and scientific resources in its Universities that are unique and that can assist in defining the values of each of our estuaries and help develop them for the ultimate good of the State. The utilization of University resources, in turn, will help focus the attention of faculty and students on our resource problems and thereby provide a reservoir for personnel to be employed by the regulatory agencies. The scientists and engineers at the University of North Carolina should like to ally themselves with State government in the preservation of our estuarine resources.

Colonel Pickett: Does the panel have any questions? (None indicated) Next is Mr. N. C. Magnuson of the Corps of Engineers, Wilmington.

Mr. N. C. Magnuson: Colonel Paul S. Denison took part in the flight yesterday and regrets that he couldn't be here today and I will read his paper for him:

"I appreciate the opportunity to attend and participate in this meeting occasioned by the Clean Water Restoration Act of 1966. The Wilmington District Corps of Engineers, recognizes the value of estuaries and estuarine areas and is vitally interested in the study of pollution problems involving all of those areas in the State of North Carolina, which coincide with District boundaries. All Federal and State agencies must work together to become true champions of conservation in the development of our natural resources, particularly in the estuarine areas.

The Corps of Engineers has the responsibility under Federal Law for development of water resource projects for navigation, flood control, drainage, and shore and hurricane protection. The Corps of Engineers is a service organization. In this capacity the Corps is required to investigate and study projects requested by local interests represented by the State, County or Municipal Government and approved by Congress. Projects economically justified and feasible, become eligible for construction under various congressional authorities subject to compliance by non-Federal interests with the terms of local cooperation which may require a cash contribution, furnishing of land, right-of-way, easements and other things necessary for project development.

There are 45 active navigation projects in the Wilmington District, totaling some 1,300 miles of waterways which serve the commercial fishing fleets, recreational boating and the rapidly expanding industrial economy of the State. With the exception of Wilmington Harbor, which has an authorized depth of 38 feet, and Morehead City Harbor, 35 feet deep, the projects have depths of from 6 to 12 feet. The Wilmington District's part of the 12-foot deep Intracoastal Waterway is 308 miles long. Many of the remaining projects are on the sounds and estuaries above Cape Lookout. Of the 1,300 miles of waterways in the Wilmington District, most of the mileage requires either no dredging or infrequent dredging. Therefore, dredging for maintaining and constructing navigation channels does not constitute a serious source of pollution. Nevertheless, standard operating procedures and practices safeguard against pollution from dredging. Virtually all land spoil areas are diked; spoil areas in open waters are selected where minimum or no damage would be inflicted; and various methods are used to control turbidity. Selection of spoil areas and the control thereof is coordinated with appropriate Federal agencies for maintenance of existing projects and for new projects. A particularly fine degree of coordination and cooperation has been achieved with all Federal and State and local agencies interested in all phases of water resources conservation and development.

Planning by the Corps of Engineers for navigation projects in the sounds and estuaries include consideration of such matters as layout of channels and structures, affect of changes on shoaling pattern, circulation, control of turbidity, tidal prism, salinity, aquifers, marine life and other environmental factors to minimize damage to or enhance the value of the estuarine areas.

All applications to the Corps of Engineers, by public and private interests, for permits to construct facilities in navigable waters are fully coordinated with Federal and State agencies having pollution control responsibilities.

District-owned floating plant is equipped with acceptable waste treatment facilities; and as soon as appropriate Federal standards are developed, it is anticipated that treatment facilities will be required for all Corps-owned major floating plants and contractor-owned major floating plants performing work for the Corps of Engineers. Further, the District discharges a continuing responsibility for investigation, reporting, and treatment of spillage of oil and other hazardous materials in navigable waters.

In addition to the broader control of pollution in estuarine waters, the Corps of Engineers is concerned with effluents from industrial outfalls that affect the navigable capacity of waterways.

In managing sounds and estuaries it is imperative that navigation channels be maintained and/or modified and that additional channels be provided when careful consideration of all factors involved shows that such channels are warranted. Toward this end the Corps of Engineers endorses a program of estuarine management by the State and Federal Government which maintains a proper balance between development and conservation.

Thank you again for the opportunity to present the views of the Wilmington District at this meeting."

I thank you.

Colonel Pickett: Now we'll hear from Sterling Bailey of the Weyerhaeuser Company.

Mr. Sterling Bailey: My name is Sterling Bailey, Technical Director, Pulp for Weyerhaeuser Company in Plymouth, North Carolina. I am also charged with the technical aspects of environmental resources management for the Weyerhaeuser Company, North Carolina Division.

We have examined Section 5(g) of the Federal Water Pollution Control Act, as amended, in order to confine our remarks to the intent of that subsection. We hope our statement will be helpful to you.

This action is timely. It is gratifying to know that specific planning is proceeding on programs necessary to protect these valuable water resources and to enhance, in a balanced and rational manner, their beneficial use.

Weyerhaeuser Company has long had an interest in the best use of estuarine waters. The Company has engaged in extensive and detailed costly research studies since as far back as 1952. This research has contributed materially to the total knowledge of the biology of these water bodies. Contributions have also been made in the fields of shell fish and finned fish. Weyerhaeuser Company is a co-sponsor of continuing study of the striped bass in the Roanoke River and Albemarle Sound.

Weyerhaeuser Company scientific and technical personnel maintain communication with scientists in the public and private sectors, relating to problems concerning estuarine waters. These communications are valuable to all participants in that each thereby increases his sum total of knowledge in this field of endeavor.

This is indicative of the Company's continuing interest in this subject.

I would now like to list some specific recommendations:

1. Developing a Management Plan for each Estuary - Estuaries and estuarine waters are valuable natural resources. A most important goal should be to develop a management plan for each estuary which will provide the best return by balanced uses of that estuary.

Each estuary is unique. Each represents a biological system of its own. Each requires specialized study and evaluation.

Every use of each estuary will contribute pollution of some type with, and without varying degrees of effect. The total impact of this composite pollution can be controlled by application of the State's water quality standards and plans of implementation now in effect.

2. Principal Responsibility Rests with each State - The primary responsibility for management of estuarine water quality rests with the State concerned. The State would call upon Federal services beyond its capability to provide. Examples would be dredging by the Corps of Engineers, Civil structure construction in the estuary under the control of the Corps of Engineers, and those examples which arise because of national security and welfare. However, the State is responsible for the waters that discharge into an estuary, therefore the State should be responsible for the well being of that estuary.

An examination of the responsibilities held by the State and by the Federal Government should reveal the need, if any, of better definition of responsibilities and their division between the two levels of government.

3. Resolution of Relative Importance of Uses - Resolution of the importance of each use is a most difficult task even when present uses only are considered. This becomes even more complex when consideration is given to potential future levels of use in each use category.

Such resolution will be very time-consuming. However, no plan of estuarine management will be fully worthwhile unless this type of study is done with deliberation. This does not preclude initiation soon of elements of the program which available scientific knowledge indicates desirable.

4. Care Needed in Changing Physical Features of Estuaries - We recommend that changes to the physical features of an estuary be made only after careful thought has been given to any adverse effects that might arise as a result of such changes. Examples would be: dredging, relocation of channels, diversion of waters upstream, and construction of highways across estuaries.

5. Tidal Effect Dictates Upstream Waste Control - The flow of water from an estuary is greatly affected by tidal action. Wastes flowing into a moving current are carried away from the point of discharge. However, tidal action can cause a waste particle to stay in an estuary, moving upstream and downstream for many days before it finally reaches the open sea.

Since the estuary is the "funnel" through which a geographic region drains to the sea, it can be expected that residual wastes will pour into that "funnel" from the entire region.

In any plan of estuarine management, it would therefore seem to be important to reduce this residual waste load at all points in the region.

6. Important Uses of Estuarine Waters - We consider these uses to be quite important:

Watercourse outlet to the sea

Harbor for commercial transport

Fisheries - commercial and sport

shellfish and finned fish.

Industrial activity

Recreation - local and tourist

Wildlife activity

We cannot now give a general opinion of the relative importance of any one of these activities for estuarine waters in general, or in this case, in particular. Again, each estuary presents a unique situation, with hydrological, economic, biologic, and chemical factors differing markedly in each case.

In the development of plans for specific estuaries, the Company would offer specific thoughts on these uses at the appropriate time.

Weyerhaeuser Company's corporate policy pledges the corporation to operate its facilities in such a manner as to avoid damaging other uses and users of air and water. The policy further pledges the Company to use all technically and economically feasible methods available to it to comply with applicable regulations on environmental protection.

"Protection," however, is not enough. In the past, we in the United States have made relatively little attempt to manage water in the same sense that we manage our agricultural resources, or in the way in which intensive management is beginning to be applied to our forests.

The need for intensive management of the Nation's water resources has been slower in obtaining recognition - but the need is no less pressing. We should already be planning for rational and systematic management of water.

Weyerhaeuser Company urges that we begin to work now toward managing estuaries to obtain a high yield of estuarine values, just as we manage timberlands to achieve a high yield of forest-associated values. Let us begin now. Enhancement cannot come until we do begin.

Colonel Pickett: Thank you; are there any questions? (None indicated) Next we have Mr. Don Mucklow. Mr. Mucklow --

Mr. Don Mucklow: My name is Don Mucklow and I am speaking for the Hatteras Yacht Company and for the American Boat and Yacht Council, and the Boating Industry Association. I thank you for the opportunity to make this statement.

We feel that an overall set of requirements as to the sanitary waste disposal should be established, one which will cover all areas to be considered.

At the present time some States have no laws governing water pollution while others have requirements which do not match the requirements of their neighboring States. This results in an impossible situation for the boat manufacturer, making it an impossibility to fill an obligation to his customers.

Some of the systems which have been approved leave much to be desired. My personal evaluation of one such unit, which is approved here in North Carolina, proved that this system becomes very obnoxious with only two people aboard and that within two days time. To my knowledge there are no pumping stations available in most areas. I believe that Chicago, in its sad state of affairs, has only two.

Boatmen have observed at first hand more of the damages of pollution and littering of this country's waters, than any other group of persons. Fewer groups than boatmen know that pollution takes the fish out of fishing, the health out of water sports, and the beauty from our shores, beaches and rivers. Puts scum on our hulls, extensive oil, chemicals, and garbage in the sea air and ruins the spectrum of blue in the waters. No one will have to sell boatmen on fighting pollution. And you don't have to sell the boating industry, either. Our very livelyhood depends upon clean boating waters. Recognizing the potential seriousness of this problem, the industry took positive steps almost ten years ago to encourage manufacturers to provide for adequate treatment or retention devices. Every manufacturer of boats with toilet facilities has been asked to provide adequate space so that a sewage treatment or retaining type device could be conveniently installed.

The response to these requests from manufacturers has been extremely gratifying, because virtually all boats coming off the assembly line today, provide adequate space for sewage treatment or retention type device.

Four years ago, the National Association of State Boating Law Administrators appointed a pollution control committee to investigate how much pollution boats were in fact contributing to our Nation's waterways. After an exhaustive nationwide survey, the NASBLA Pollution Committee, concluded that the pollution from recreational boats was negligible in most all waters. A few specific congested mooring areas in stagnant water were the only exceptions. The committee further found that less than 10 percent of the nations recreational fleets are equipped with marine toilets.

The NASBLA Act would prohibit untreated sewage discharge into the water, but allows toilet use with chemical treatment devices meeting certain effluent standards, incineration or holding tanks. Just what a recommended minimum treatment standard should be, has been studied at length by the National Sanitation Foundation of Ann Arbor, Michigan. The nonprofit testing laboratory was assisted in this work by State and Federal Health Officers, the people who should have the final say on acceptability of treatment devices in their respective jurisdictions. In May of 1966, at Ann Arbor, Michigan, the National Conference on Watercraft Waste Disposal was held under the sponsorship of the National Sanitation Foundation, in cooperation with the U. S. Public Health Service and the Tennessee Valley Authority. Its objective was to review effluent criterion recommended by the interdepartmental committee on sewage and waste disposal from a vessel, as established by the Division of Environmental Engineering of the Public Health Service, as they may apply to pleasure craft.

Another objective was the establishment of criterion for evaluating the performance of devices designed to treat waste and render them acceptable for discharge from pleasure craft in accordance with the effluent criterion just mentioned.

Endorsement of the National Association of State Boating Law Administrators Model Act, implemented by the Sanitation Foundations uniform standards for watercraft sewage treatment devices, has come from many quarters. In addition to the Outdoor Boating Club of America, the National Boating Federation, (a national organization of state boating clubs), is in favor of the approach. So is the National Conference of State Sanitary Engineers. Regretably this apparently is not the approach taken to date by the Federal Government. Two study reports of vessels discharges were recently prepared by the Secretary of the Interior, through the Federal Water Pollution Control Administration: One for the Congress and one for the President. Boaters believe that data presented and the recommendations made in these studies are highly unrealistic. For example, these studies say that 1.3 million of the 8 million motor boats, sailboats, canoes, and row boats in the country, are equipped with marine toilets. This is one out of every six boats. Yet a recent survey has proven that only 50,000 to 700,000 units of all marine toilets manufacturers have ever been produced. Even if every unit were still in use, which is highly improbable, the total production over the years has amounted to only half of what the Federal Water Pollution Control Administration reports claims are in use. We contend that approximately only ten percent of the 8 million boats, of all categories, are equipped with marine toilets.

In view of the inaccuracy of the FWPCA's findings concerning the magnitude of discharges from pleasure craft, we would suggest that closer liaison with boating groups should be developed where none has existed. As a matter of fact, the National Association of Boating Law Administrators suggested just that by resolution at their Annual Meeting in San Francisco last November. Granting that a reasonable regulation of discharge from pleasure craft in some areas is desirable, we feel that the most effective solution from the boaters standpoint, would be the adoption of the NASBLA Model Act by all States - covering both waters of exclusive State jurisdiction, and the waters of concurrent State Federal jurisdiction.

Federal Legislation setting guidelines which the States will be obliged to follow, is necessary to secure uniformity. There is a precedent in this, in the Federal Boating Act of 1958, under which to date 47 States have complied with Federal Standards in exchange for the privilege of numbering pleasure craft on all waters within their territorial limits. In the same manner, NASBLA's Model Act on waste discharge on boats might be made Federal Law. Be they State or Federal Administered, boaters would have only one basic law governing them in pollution and littering matters. This answer seems very reasonable, logical, workable, and in accord with various Federal Water Quality Control Laws which set guide lines, but leave primary responsibility for administration and enforcement to the States. Would you believe that Senate Bill S-2525 makes a start in the direction of State-Federal cooperation, since it seeks the enforcement aid of the States in subsections I and II of Section XI. However, we feel that substantial improvements can be made in the Bill.

We feel that separate treatment of recreational and commercial or military craft should be given. Either in separate sections of the Bill or by two altogether separate bills. Recreational vessels and commercial or military vessels have little in common in terms of size, number of persons aboard, frequency and duration of use, space available for treatment facilities, or waters of travel.

Considerations of pollution control necessarily should be quite different for recreation vessels and those of commercial vessels.

A Federal vessel pollution act therefore would only go part way towards covering recreational vessel use, since it could apply only to Federal navigational waters. Stating it from the boatman's point of view, a Federal act would still leave the field open for State laws applicable to interstate waters, which could be non uniform and even conflicting both between States and even within a State. As stated before the conflict with vessel pollution laws prevail in some areas of the country right now. Such non-uniform vessel pollution control laws cannot but create hardship for the boatman and enforcement personnel alike, and contribute little towards the control of pollution.

The solution we feel, is an act which will cover not only recreational vessel pollution control on navigational waters, but which will provide incentive to the States to adopt like measures for interstate waters. This would insure uniformity between the State and Federal laws. We respectfully submit that this may be best accomplished by Federal enactment of the essentials of what is known as "Model Act of Sewage Disposal and Littering by Vessels," by the National Association of State Boat Law Administrators referred to earlier.

Several States have already adopted the act, or have very similar existing laws. This means a foundation for uniform laws already existing. Support for a model act could hardly be more wide spread. The NASBLA Model Act has the endorsement of the State boating officials, the boating industry and other boating organizations, as well as sanitation and public health organizations. As in the Federal Boating Act of 1958, State administration of the program was in the Federal Guidelines as the incentive for State participation.

Also an adopting of the essentials of the Model Act, at the Federal level, would still preserve and incorporate all the necessary discretionary power and regulatory authority of the Secretary of the Interior under S-2525. Modification of the NASBLA Model Act which need all of the goals would not be difficult.

Under the S-2525 approach in the Model Act, Pollution Control in Recreational Vessels, there is evisioned development of standards for sewage discharges to be promulgated by the Secretary. Under both approaches, the Secretary should consult with other appropriate government agencies and private groups.

In our opinion, it would be a mistake to give any Federal agency absolute authority to set standards or to approve devices to control waste disposal from watercraft. There has to be close collaboration between the Federal Government and State and local agencies responsible for water pollution control, public health, and boating law enforcement. Any rules or regulations established by Washington without such collaboration could result in Federal-State conflicts of law that could make matters worse for boaters. Not only from State to State, but when proceeding from State to Federal waters within the boundaries of the same State. This can be overcome by providing proper guidelines in the legislation, or at least by building a substantial legislative history which will aford no possible future misleading of Congressional intent.

If the Federal Water Pollution Control Administration had consulted and collaborated with State boating law administrators, when they were investigating pollution from recreational watercraft, we believe they would have reached a more realistic conclusion in the report that they sent to Congress. However, our concern is about the absolute necessity for uniformity, we should not overlook the fact that to be truly effective,regulations must be realistic. If the law is completely impractical or impossible to comply with, it will be circumvented, and the result of such circumvention often creates new and greater problems than overall disrespect for the law. This would be absolutely true in regard to anti-pollution.

Colonel Pickett: Thank you, next is Mr. William H. Potter, Beaufort Fisheries Incorporated.

Mr. William H. Potter: Thank you, Colonel Pickett, and members of the panel. I probably shouldn't say anything but from what I have heard we need to do something about it. We need to further study the available potentials from that resource and I would like to make a recommendation prior to making my statement into your record: that an inventory at least of the estuarine area of North Carolina be immediately made, so that the true potentials and the house-keeping of this tremendous resource can be called to the attention of the legislature. The business people and the users of this resource - I brought with me incidentally an inventory of Carteret County - which we people in Carteret County are quite proud of in that there has been an inventory of the land mass of Carteret County. I pay a tribute to some of the gentlemen who are present here in the audience today for it. The results of the plans were to inventory the land resources of this County. I heartily recommend to the agencies of our State and other States that the first prerequisite of diagnosing something is finding our what we have and what best can be done to make the resource more readily available and more equitably used by all folks.

I see a picture of water back of me and I'll open my remarks to you ladies and gentlemen by reminding you of those who don't know it that the water in that picture is six billion years old. There won't be any more; it can't be destroyed but it must be managed and the management of the resource that makes the reason for our existence on the face of this earth is perhaps the greatest resource that we have and the least understood.

The "Clean Water Restoration Act of 1966" is of considerable interest to the Beaufort Fisheries, Inc., in that this Company harvests Menhaden from the inland waters of Carteret County and the outside ocean waters along the North Carolina coast and processes this non-edible fish into Fish Meal and Fish Oil.

A major concern in regard to pollution arises from chemical fertilizers, insecticides and pesticides, along with large quantities of rotted matter, being carried into the estuarine areas as the result of heavy rainfall. As increased industrial development adds to the undesirable additives loosed into these areas of North Carolina's coastal regions, such adverse effects as have become noticeable elsewhere will have increasingly serious adverse results within the entire scope of commercial fishing, sports fishing and any and all attempts to make full use of the marine resources of the coastal area.

There is no doubt that the estuarine areas afford environments for the perpetuation of shellfish and fin fish. Neither is there doubt of the tremendous resource of the area due to increasing recreational use of water and beach assets. Here in Carteret County it is anticipated that the establishment of the Cape Lookout National Seashore will have a great impact on such use by tourists.

There is some feeling that pollution, as we humans identify it, contributes to the attraction and survival of the creatures, or some of them, living in and on our estuarine properties. Admittedly, the unsavory chemical additives cannot be absorbed. In fact, the concern held by many is that "too clean" waters and bottom lands could create insufficient food sources for the animals of the water kingdom.

The central coastal area of North Carolina has embarked on a general program of pollution abatement. Morehead City, Newport, Beaufort, Atlantic Beach, Havelock and the County school systems have made, or are in the process of making, waste treatment a part of sewerage disposal. The Carteret County Planning Commission has initiated a well designed effort to improve the zoning and the garbage regulations of the County to contribute to a cleaner rural community. The North Carolina Ports Authority has incorporated into the design of the bulk handling facility at the Morehead City facility such waste and dust control as seems necessary to prevent unacceptable pollution from the handling of phosphate shipments. All together the combined efforts will aid in overall economic, sanitation and civic improvement.

The estuarine area of central coastal North Carolina, Carteret County in particular, makes up a very large part of the total land-water measurements. Multiple navigation waterways, both "project"

(Federal) and natural, tread throughout the entire area. A list of these include:

1. Deep-water channel and harbor facilities serving the N. C. Ports facility at Morehead City, as well as other deep water water accessable land areas nearby and enroute to the Port.

2. Harbor facilities at Morehead City, Beaufort, Marshallberg, Davis, Sealevel, Atlantic, Cedar Island and soon Harkers Island, along with connecting channels such as Gallants, Bulkhead, Taylor's, Pellitier and other creeks.

3. Navigable inlets such as Beaufort, Drum, Barden and Ocracoke.

4. The Inland Waterway Canal, serving the entire reach of the North Carolina and neighboring States coastal areas.

5. Channels leading to marinas at Atlantic Beach and Morehead City.

6. Other planned navigable channels such as proposed to serve the Cape Lookout National Seashore.

The need and requirement for maintenance of the project dimensions of these and other channels creates need for "spoil" areas within the many acres of marsh land and shoal areas of the estuarine resource. The balance of "good" and "bad", in the accepted and allowed use of spoil areas, is influenced by land development requirements. Too, the very much needed protection from the ravages of tropical and hurricane storms presents a need for planned shoreline development and restoration. Whether contributions are made to the pollution abatement, to a favorable degree, by filling of the sloughs and marsh indentations which act as collection areas for undesirable debris has been the subject of discussion for the last few years. There is no question that purging benefits of incoming and outgoing tides are valuable in pollution reduction programs. It is true, too, that oversaturation of this capacity creates serious problems. The least of these being the mere moving of undesirable materials just to another place. Marine biologists are emphatic in their statements regarding the continuous value of the estuarine areas to the fisheries resource. Much more is in the process of being documented to prove the lasting value of clean waters and clean bottoms within the estuarine areas.

There seems to be limited choice where management of the estuarine resources is considered. While each coastal State has some wetlands and other areas which make up their estuarine resource, the State of North Carolina has more than her share, due to the outer-banks formation. Such management, which must develop regulatory use, should be well defined in proof of need. There is growing resentment to

Federal control. There must be consideration given to like and difference uses of the estuarine areas in each of the States involved. Even though the areas of Pamlico Sound here in North Carolina are nurseries for fishes appearing in the resource along the coastg of more southern States, there must not be regulations preventing the harvesting of commercial quantities of marketable seafoods. States must retain the central control of their own estuarine resource, but there must be some consideration given to the contributions to the estuarine resource of neighboring States.

Here in North Carolina there would be very little commercial fishing, or sports and recreational fishing, if there were not such large areas of these estuarine resources. Without suitable environment there just would not be any fin fish and shellfish. Much of the supply of fish and shrimp afforded the State's waters south of North Carolina originates in the sounds and bays of coastal North Carolina.

The partnership formed by North Carolina, South Carolina and Georgia in the creation of the Coastal Plains Development Commission, serving all of the counties of each state situated on the coast, will study and work toward improvement in the use of all resources. It is almost assured that the estuarine areas will receive high priority.

To conclude these limited remarks a plus must be added for the establishment of more STABILIZED inlets along the North Carolina coast. Channels serving these stabalized inlets must be maintained to project dimensions at all times, too. These are doorways and water highways, serving multipurpose benefits to the entire economy of the State. The proper salinity of the impounded waters, the drainage afforded during times of excess waters, the navigation benefits to all types of water commerce all add up to justifications for their existence.

No worthwhile accomplishment can be expected until a NEED is converted into a DESIRE to do something about it. The desire for estuarine management and the utilization of the full benefits of the resource and the coastal area as a whole is apparent. Properly applied efforts can only improve the State of North Carolina's service to her people. This applies to the Federal government as well.

Outline of Comments:

a. Estuarine resources of North Carolina are not fully utilized. This is due to lack of understanding of the value.

b. The value of the estuarine areas to commercial and recreational fishing is not accepted by the users of the resource.

c. Pollution, whether from agriculture, industry or municipal waste, is placing an ever increasing burden of load on the natural adsorption capacities of the estuarine areas.

d. Management of the estuarine resource in neighboring States must include policies and practices compatible to the several users of the resource.

e. It is already late but timely that a comprehensive study be made by each State and by the affected States collectively of the true value of the estuarine areas and the best means to further their uses.

While this comment is addressed to WATER pollution and the need for examination of the present and future of the status of values, it is not proper to overlook AIR pollution as well. Herein may lie the dangers to humans to a greater degree than that of water pollution. Thank you.

Colonel Pickett: Are there any questions by the panel? (None indicated) Next is Mrs. Philip A. Davis, League of Women Voters of North Carolina, Mrs. Davis --

Mrs. Philip A. Davis: I am Mrs. Philip A. Davis, League of Women Voters of North Carolina, Water Resources Chairman. The League of Women Voters, a nonpartisan organization, is dedicated to the principles established in the Constitution of the United States. The League works to promote political responsibility through informed and active participation of citizens in government. Through its program the League gives sustained attention to and takes concerted action on issues chosen by the members. In the field of water the League has for years supported National policies and procedures which promote comprehensive long-range planning for conservation and development of water resources and improvements of water quality.

We can agree that the battle for cleaner water in the right places at the right time is far from won. Significant steps have been taken. Technological and scientific advances offer a range of alternatives as never before. There seems to be however a great void in ways for aroused citizens to channel their concerns into effective action. Those who understand "Water Needs" and the "Political Process" must provide opportunities for the public to join the dialogue while there are alternatives. Agencies and developers have tended to have all plans signed, sealed, and delivered before the citizen is permitted to participate.

In our affluent society the intangible values on recreation, wildlife, and beauty are increasing. Monetary value cannot be the weighted factor in decisions. The obligation to the future must be placed alongside technological advancements, industrial growth, and the total economy in all decisions. The judgment of the widest possible range of society must effect plans early, not after the die is cast.

North Carolina has a polarization of estuarine interest; wildlife to industry. Pollution is magnified by industry in estuaries. The threat to animal and plant life is real, especially in estuaries. On the other hand, the coastal section of our State must enrich its economy. Industrial growth is essential for higher living standards. The choice of how much industry and where can be made satisfactorily only with early inclusion of all facets of our society. Cooperation is the key. Cooperation of all levels of government; cooperation of all departments. We can not afford jealousies. Shared responsibilities will give us a chance for cleaner water in the right place at the right time.

Thank you for this opportunity to speak.

Colonel Pickett: Mrs. Edward P. Mertz, Cherry Point Garden Club. (There was no statement given) Mrs. Clarence Beasley, Citizens for Clean Air and Water, New Bern, N.C.

Mrs. Clarence Beasley: My name is Emma B. Beasley and I am a housewife and a member of Citizens for Clean Air and Water, New Bern, North Carolina.

In the past year there has been a tremendous interest in North Carolina and in the Nation as a whole on the subject of water pollution. This has been very gratifying to me personally. I have no personal suggestions, etc. (No copy of Mrs. Beasley's statement was left for the record)

Colonel Pickett: Mrs. Mary Baker --

Mrs. Mary Baker: I am Mrs. Mary Baker of the Havelock Garden Club. I have very little to say. I was interested in what Senator Whitfield had to say about the government, that we might have to sue the government. I live near Slocum Creek in Havelock and sometimes we feel like we have a lot of unnecessary wastes from the Cherry Point Marine Station, and I would like to see the Slocum Creek area cleaned up. Thank you.

Colonel Pickett: Thank you; now, Mrs. James B. Willis, Carteret County Planning Commission. (Not present) Mr. George W. Ball --

Mr. George W. Ball: My name is George W. Ball. I live in the Harlowe Community in Carteret County, North Carolina, and have served as an officer of Carteret-Craven Electric Membership Corporation for almost 28 years and currently serve as President. This rural electric cooperative is owned by its members and its lines extend along a large portion of coastal areas of Carteret County and the Neuse River in Craven County. Many of these members are dependent on the fishing industry for their livelihood. The statement I make today is based on my personal conclusions but in their behalf.

Population growth and modern day mobility of these people have created water pollution problems up and down our coast. Encroachment of man on our rivers, sounds, and other waterways in increasingly large numbers and the continued delay to recognize and deal with human, industrial, and agricultural chemical wastes can jeopardize the future of the fishing industry along the Atlantic coast line.

Visitors are looking for clean water where recreational facilities are available. In wintertime our waterfowl hunting is the chief sport. The sportfisherman is looking for clean water in the summertime. The vacationer will soon desert an area where water is polluted.

While our Cooperative promotes new industry and encourages the growth and well being of our present industry we do feel that adequate control of water pollution is needed to safeguard the interests of the people.

We would recommend strongly that the job of control and management of our clean water problems be left in the hands of our State and local people. While this is a National problem, and is becoming more acute as each day passes, we believe that State and local people can meet standards established for the entire Nation.

Colonel Pickett: Next is Randy Perry, of the Leopold Wildlife Club, North Carolina State University.

Mr. Randy Perry: Senator Whitfield, Colonel Pickett and members of the panel, ladies and gentlemen, my name is Randy Perry and I am President of the Leopold Wildlife Club at North Carolina State University. First of all, I would like to point out that I do not feel that Eastern North Carolina is under-developed, at least not to the extent that we should even faintly consider sacrificing our valuable natural resources such as swamps, estuaries, or other wetlands for short term, quick dollar, programs and development projects. Excess housing projects only cause an increase in the population, thus placing an even greater strain on all our natural resources. Excess grain production only means more government supported price.

Instead, I feel that our wetlands and estuaries should be conserved - conserved to the point of preventing water pollution and unnecessary dredging and channelization.

Estuaries have a high efficiency level of productivity, and thus are considered nursery grounds. The shallow waters which contain an abundance of plankton are depended upon by shrimp, oysters, menhaden, and other aquatic organisms for food, shelter, and as a spawning and rearing grounds. North Carolina has some of the most productive estuaries in the world -- but they are dwindling at a rapid rate.

I feel conservative measures for our wetlands should include:

1. A prevention of unnecessary pollution by any polluter.

2. A prevention of channelization, dredging, and spraying except where absolutely necessary, and when deemed necessary, the prevention of spoil deposits on oyster, and other shellfish beds.

3. Education of the public of the values of wetlands and estuaries.

4. An upgrading of the present classification of our streams and rivers.

5. More wetlands and estuary research.

I thank you.

Colonel Pickett: Thank you; are there any questions? (None indicated) Now Mr. Robert D. Darden of the North Carolina Salt Water Sport Fishing Association.

Mr. Robert D. Darden: Mr. Chairman, I am here by proxy, Mr. Jack White is President of this association and he had a heart attack in Fayetteville and he could not be here and he asked me to present his statement. First of all here's the statement:

"First of all let me thank you for the opportunity to make a statement on behalf of the North Carolina Salt Water Sport Fishing Association, Inc. My Association would like to go on record as lending our wholehearted support to the Clean Water Restoration Act of 1966 as well as Interior Secretary Udall's recent ruling that North Carolina's water pollution control standards are not tight enough. We, as taxpaying citizens, are usually opposed to Federal intervention in our daily lives. We feel, however, that an exception is in order. Looking back on our most recent fish kill, it is obvious that strong intervention is needed. In fact, according to a recent newspaper article, there have been 10 such kills already in 1968, in North Carolina.

The North Carolina Water Resources Board has contended that Federal water standards will discourage industry from coming to North Carolina. We only need ask that if these Federal standards are imposed on all 50 States, where will industry run? Perhaps this will cause industry to develop new methods of treating their effluent -- a long overdue development in this highly technological day and age.

While we are an organization dedicated primarily to the preservation of our marine fisheries, we strongly oppose the pollution taking place in our rivers and estuaries. It is known that almost 70 percent of our most valuable fish species on the Atlantic coast are directly dependent on estuaries at some stage in their life cycle. Some of these species such as flounder and croaker can, and do, enter almost fresh water early in their life cycle. This dependence is a specialized one, probably evolving from a need for food and survival. We say to you today, that if man continues to pollute the rivers and estuaries at his present rate, in 10 to 20 years we will find ourselves with "messtuaries" (spelled MESSTUARIES) not fit for animal life. What will this do to our fishery resources that are already showing a decline in abundance due to man-made changes in the estuaries, overfishing, so-called trash fishing, and pollution? We need to develop more and better ways to protect and utilize this God-given resource.

We would like to propose that the State of North Carolina determine through legal means, the ownership of our marshlands. If it is found that the State does not own these important nursery areas, we propose that the legislature set aside funds to buy as much marshland as possible in order to preserve these areas. If the State is not farsighted enough to do this, we would once again encourage Federal intervention.

Gentlemen, we know from scientific studies that our estuaries serve as nutrient traps for the vital elements coming down from upstate. If the estuaries are a reservoir for nutrients, is it not conceivable that they also might become reservoirs for pesticides, heavy metals, chemicals, and other types of pollution? All of these could eventually upset the balance of nature in the estuaries, possibly with detrimental effects.

I would like, at this time, to make a statement on the future of our coastal cities. We feel that their future lies in the development of a rapidly growing industry called tourism. Robert N. Helding, in a speech made in Spokane, Washington, said: "if you took the payrolls of 12 of the largest companies in the United States and combined them, they would add up to only about one-half of the total dollars spent by tourists in the same period of time. If, for example, a community can attract only two dozen tourists a day throughout the year, it is economically comparable to acquiring a new manufacturing industry with an annual payroll of $100,000." So you see, Gentlemen, citizens want a place to go and they are willing to pay for it. Suppose, however, that the male member of the family is a sportfisherman, either occasional or dedicated. Is he going to take his family to an area where there are no fish? Where all of the natural resources have been depleted? Probably not! He will probably head for the mountains to spend his money. For this reason, we urge the coastal cities to join in the protection of their estuaries and the development of their number one industry -- tourism.

Once again let me say in closing that our estuaries, and hence our fisheries, are in danger. The choice of the future is ours today -- Will we end up with natural fish-producing estuaries; or will we end up with what we are well on the road to producing, "messtuaries"? Thank you.

/s/ J. C. White
President."

Now, Mr. Chairman, if I may, I would like to - at the risk of losing my non-profit job as a director of the Salt Water Fishing Association - take an exception to the means that Mr. Whitfield suggests rather than the ends that he has in mind. Everybody is in favor of clean water and an abundant wildlife. They're probably as much in favor of this as in favor of married motherhood and against sin, but I take the position, that has been stated by Senator Whitfield that the answer to the thing lies in our organization. Colonel Pickett, we think that you are doing a good job and that federal intervention is too prevalent in too many of the phases of our daily life. Senator Whitfield mentioned only the Department of Education to send a shiver through everybody in the courtroom. So, I would say that the State control of this difficult problem is the answer to it and that is my statement as an individual with no particular knowledge of this important problem that is being presented here today which is very interesting to me. Thank you, sir.

Colonel Pickett: Thank you. Now, Mr. Oscar L. Schneider. (No speech or statement indicated) - Mr. B. O. Kettner --

Mr. B. O. Kettner: I would like to say that most generalities have been covered. Well, from what I heard it's been very interesting, the specific items, specific problems in this area, and I would like to bring one to mind. For seven years I have been fighting a losing cause up to this time. I have been trying to get the area in Havelock known as Slocum Creek, which joins Cherry Point and the Havelock area, and Cedar Creek, up in that area. I do most of my business in Craven County and am interested in both of the counties. Back about seven years ago we had a very large fish kill in Slocum Creek which was brought to the State's attention; four years ago we had another fish kill. We had quite a few problems with pollution which I think need to be checked into thoroughly. We had a problem of construction and sedimentation. Several of the different gentlemen here have brought up this problem in this area and, yes, we do have it. The reason I brought up about the head of Slocum Creek is we have very little water now in there and it meets the tide and slows up the sedimentation. I will gladly go out anytime with anyone to inspect this creek where sediment has filled up the creek in a couple of places to a depth of three or four feet. My father and I moved here in 1919 in this area. At that time tug boats could run up Slocum Creek to the bridge and up Cedar which is part of the tributary but now they cannot do that, nor even go into the place by virtue of sedimentation from construction on the base which has allowed silt down into the creek and a lot of places along there the mud is eight and ten feet deep in all of these places. At one place at the power plant sedimentation has gone about three quarters of the way across the creek. We're speaking of local things and I am speaking of an actual problem we know there. We have shown a great interest; in fact I wrote a letter to the governor several years ago, and to Graham Barden when he was living, and it seemed that we just didn't have the funds was the main reason or problem, to get these problems taken care of. Slocum Creek had 15 fishing camps and a couple of the gentlemen here can verify that. In fact Mr. Bell at Havelock was manager of the Lucky Strike, the Smithfield, Goldsboro, Camp Kettner and numerous ones that we had all up and down, but today the fish, you cannot even eat them that comes out of this creek and I present this to you and hold myself open for an inspection at any time. And one other problem, one, once the stream had been navigable; now all of the riparian rights have been taken away and we would like to see it opened for boats and fishing. Thank you.

Colonel Pickett: Are there any questions, please?

Mr. Coburn: You are speaking of the creek; would this be solved when the Town of Havelock gets its sewage plant, would this take care of a big portion of the waste?

Mr. Kettner: That will take only part of it; the greatest problem that needs to be done is all of Havelock needs to be educated, and there's been oil dumped into the stream by various small businesses, but the greatest problem is Cherry Point; as you know Cherry Point is a very large Marine Base and we have had a considerable amount of pollution coming from washing the planes and so forth. Part has been taken care of. I think more oil is being dumped into the stream that could be solved by working with the government on it and I believe they could have filters into the stream in such a manner that it would help.

Mr. Coburn: The Town of Havelock does at the present time have a sewage treatment plant under construction?

Mr. Kettner: Yes, sir.

Mr. Coburn: And being constructed with a thirty percent Federal grant. You have heard the story about Camp Lejeune?

Mr. Kettner: Yes, sir, there are a bunch of fish in Slocum Creek but not edible; too much oil in them and you can verify that; we can show you the results of this; is it possible that someone could come and check it?

Mr. Coburn: Yes, we can very well come down. This is part of the Marine installation and as you have heard this morning their pollution abatement program has been delayed, by the fact that we have been unable to get the finances to construct the facilities. We are aware of the situation and very little that we can do in lieu of Federal funds.

Colonel Pickett: It's right at one o'clock now and we have a few more to go and it's possible we can finish up in about thirty minutes; would you like to go on through and finish up or would you like to take a break and come back? (There was agreement to continue the hearing)- Mr. E. G. McKinney, Public Works, U. S. Marine Base at Cherry Point? (No statement indicated)

Bob Simpson, Wildlife Federation in Morehead City? (No statement indicated)
Mr. J. E. Wolfe, is he here? (Not present)
Mr. D. L. Ward? (Not present)
Mr. J. W. Davis, Williston? (Not present)
Mr. J. K. Warren, Jr., Trenton? (Not present)
Mr. Joseph G. Boyette, Greenville?

Mr. Joseph G. Boyette: I'm from East Carolina University. Most of the points that I wanted to bring up have been stated accurately.

We have a Water Resources Group at East Carolina University, Greenville, North Carolina. Since colonial times the sounds and rivers of eastern North Carolina have held a dominant role in development of the region. Colonial plantations depended upon water access for communication and commerce with one another and the outside world. Roads gradually replaced the rivers as major transport arteries. Centers of commerce developed wherever major highways intersected, and many older river towns decreased in relative importance. Large areas of North Carolina have become isolated since north-south traffic now depends upon more inland routes. Geographical isolation and scarcity of power kept population density low, which resulted in economic and cultural depression. Thus, in contrast with more northerly estuarine systems having similar geological and biological characteristics, North Carolina estuaries remained only slightly developed by industry. Despite social and economic changes since the colonial period, life in eastern North Carolina is still closely tied to estuaries. The economy of this region now depends upon traditional individual pursuits, such as farming, growing pulpwood, and commercial fisheries. The estuaries have always been used for recreational purposes by residents, but improvements in transportation now make it possible for many non-residents to participate in this use of the natural resources. Recreation provides a steady inflow of money and indirectly provides jobs for many residents who provide goods and services (e.g., real estate, food preparation, service stations, etc.) Recreation is, thus, an important "industry" in the east; and its continued importance depends upon maintaining those values which attracted non-residents in the first place. As with any kind of change, recreational development results in changes in the natural balance within the area being developed.

A biological principle often overlooked, or simply ignored by developers is that the effects on the entire natural system may be much more extensive than the immediate area modified by mans' activities. We apply this principle when we use oil to kill mosquito larvae in swamps and ditches. Adding oil to one environment (aquatic) has a measurable effect in another (air). The procedure outlined above sometimes has a dramatic effect on the mosquito population, but what do we know about its effect on mosquito-eating birds or other animals which live in swamps and ditches? Although less obvious to man, these effects may be even more dramatic and, indirectly, more important to man than simply reducing the mosquito nuisance.

Recreational development of our estuaries will result in an upset of the natural balance, but this upset is partially self regulated in that generally the desirable recreational values correspond to situations promoting stability of the natural environment rather than modification. Industrial development is also self regulating but at a far lower level than recreational. Industries can operate efficiently under environmental conditions of water and air quality far lower than those required for recreational use. Thus, recreational use tends to maintain environmental quality at a much higher level than industrial use. Industry and recreation can be compatible if the minimum environmental quality requirements are set by recreational use.

Recognizing the historical, current, and future importance of our estuaries, the East Carolina University Water Resources Group urges those responsible for making decisionsconcerning estuarine development to determine the actual value of this resource to present and future North Carolinians. We further urge continued government support and leadership in the study of the biological, economic, social, and political aspects of resource development. Most efficient use of our estuaries requires an appreciation of their immense direct and indirect value to man and an understanding of their function in the balance of nature. The optimum balance between recreational and industrial use of our estuaries cannot be determined unless the problem is approached from the view-point outlined above. I thank you.

Colonel Pickett: Next is C. J. McCotter from Bayboro.

Mr. C. J. McCotter: I am from Pamlico County and the Administrator of the Health Department there, and also in charge of the mosquito control program.

For you gentlemen that flew over the North Carolina estuaries yesterday, you might have seen what looked like to some people a lot of scarred earth. Now, I will admit that it did look like scarred earth in some cases, but bear in mind this one thing: do you want scarred earth or scarred people? In Pamlico County - until a few years ago - it was the mosquito capitol of the world. Today we're able to live there in a satisfactory manner due to this program. It is true that we have had to change a few of the marine lanes. A number of years ago when we first started we had a lot of comment from the Wildlife people about ruining the duck habitat. Yes, we did change a few potholes but for every pothole we eliminated we have put in an artificial pothole by at least one hundred fold. It's my opinion that we have one hundred times as much black duck hunting or otherwise in that particular aspect. Now when we go back to scarred humans, there is such a thing as encephalitis. Many of you know but for those that don't, that is sleeping sickness. We have had a number of cases of that in North Carolina. We have had outbreaks where literally hundreds of thousands of people have died. We don't want that. We want our estuaries to produce a good commercial harvest of seafood; we want it for a good recreational purpose but if we do not have the number one thing, the paramount thing is the citizens that can still live there, then I think we have lost the battle in all of the planning that we're attempting to do here today.

It reminds me of what happened back in 1954. A lot of you gentlemen know that the coastline had three hurricanes; of course, we had Hurricane Hazel in 1954, that came upon the coast at Wilmington, but for the Pamlico Sound basin, it went inland. I had a good friend that was developing some high land next to these large expansions of marsh and he sold seven lots for some high land people to come down and build summer homes. The following summer he took back five of the lots because the people could not stand the mosquitoes. Now, I realize one thing, when you eliminate a piece it's soon forgotten. It is not a monument like you can put on a courthouse square. It is soon forgotten by people, but if you could turn the page back to what it has been in years past, you can rest assured, Tommy, that you would head back for the Piedmont and the mountains just like a scalded dog. We don't want that. We want recreational aspects in our area; we want commercial aspects but most of all we want a place for our people to live. I thank you, sir.

Colonel Pickett: Are there any questions? (None indicated) Mr. W. E. Caroon, Coinjock, North Carolina.

Mr. W. E. Caroon: Mr. Chairman, ladies and gentlemen, my name is W. E. Caroon and I am from Currituck, North Carolina. I represent private citizens. I have heard you people discuss the responsibilities of organizations, cities and groups here today in regard to pollution. One of my first points is the individual landowner. It's been my observation that many of them do not understand, and in some cases do not care that they are polluting their own waterfront. I suggest that possibly a program of education; certainly responsibility on the individual should be imposed upon these people. Possibly you could say we're going to give you an easement in front of your property of two hundred feet or the center of the river, whichever is appropriate to the situation and for this you are going to be directly responsible for the pollution of this river from human created waste and trash and keep this area policed. This is just a suggestion. I would like to see something in this manner done.

The main reason I came up here to make this statement is a project that I have tried several times to get going. Apparently I am ahead of my time or too far out. I would like to see a study made, statewide from Currituck Sound to Cape Lookout or Cape Fear, clear down to Cape Fear in comparison of water heights inside our estuaries as compared to the sea outside. I think with this information compiled and studies for a year or possibly two we might find that some of the problems of flood control can be lessened; one of the gentlemen before me suggested additional inlets. In Currituck County we are having quite a problem with grass and they won't stay open. I suggested covered culverts with flood gates. The reason I suggest this is I have lived both where I live down on Currituck and on Pamlico Sound and your southern winds back water up on us; that is the only tide we have; the only water movement we have. It takes it out of the lower waters and backs it up on us. Then when the wind swings northward it floods it into the other areas. I believe if we had culverts that open and gates to control the water, when the water is flooded in the northern area, we can let it out and then not so much to run back in the southern area, to be let back out down there. It might help to control Oregon Inlet and some of the other inlets that we're now having trouble trying to stabilize.

I would like to reemphasize that I am not suggesting we jump into this now or for the feasibility of this, but in some places a small culvert might be the answer and get this area cleaned up so it can be productive again. It could be used, I believe, to control the salinity in some of these areas which would be helpful to the marine life that we wish to continue growing which would be beneficial to all of us. While talking on this, I would like to get to these shellfish. We have at this time, been informed that acres and acres of shellfish that are soon to be ready for harvest. I have been on these trawlers and helped to dredge for oysters, shellfish; I have been on the shrimp trawlers and been on the crab trawlers. I would hope that the same control that we have over this bottom to get these shellfish will continue to be applied to this area except for periods of harvest. I make that statement for this reason: I have been out and helped my father and my brother shrimping in areas where we pulled the trawler and it smelled like a cess pool; nothing could possibly live on the bottom in that shape. I believe if we opened these areas, completely open with no control on them again, areas we spent much money to make productive, this could happen again.

Possibly we might find another area to plant shellfish and start some more oysters going. I put these out for consideration. I ask you: are we going to continue something that we've gotten started here or are we going to let it fall flat? I ask you as individuals, as citizens of North Carolina the same question and I ask the members of the Board that are responsible for this thing this question: I ask the government of North Carolina this question. Shall we keep what we got going or are we going to say we have done a good job and let it go? I thank you.

Colonel Pickett: Are there any questions? (None indicated) - That completes the number of people that signed the cards that they would like to make statements. If anyone else would like to make a statement we would like to hear from them at this time? (Some person in the audience stated they would submit a statement) If not, that's all. Thank you gentlemen.

The following was submitted by Mr. William A. Shires, Chairman, N. C. Commercial and Sports Fisheries Advisory Board, Raleigh, North Carolina, who advised that he could not be present and submitted the following:

"July 26, 1968

Statement on National Estuarine Pollution Study, New Bern, N. C.

Public Hearing

by William A. Shires, Raleigh, N. C.
Chairman, N. C. Commercial and Sports
Fisheries Advisory Board.

Mr. Lloyd W. Gebhard, Regional Director

Colonel George E. Pickett, Director, N. C. Department of Water & Air Resources

I am convinced by the weight of all evidence available to me and, I believe, to the N. C. Commercial and Sports Fisheries Advisory Board, the Commercial and Sports Fisheries division of the Department of Conservation and Development, and other authorities, that there is a need to act now to resolve problems caused by encroachment upon natural estuarine areas and marshland nursery areas upon the Atlantic coast, its inlets, bays and sounds.

I strongly agree with the resolution of the North Carolina Academy of Sciences, recently transmitted, which states that this natural resource is threatened by pollution of our coastal waters and by destruction of estuarine habitat. I urge that this be controlled and, if possible, the habitat restored. Further encroachment should be severely restricted and these areas protected until such time that science gives better, more complete answers. At this time, it appears that the estuary and marsh is critically important in the ecological cycle of fish and shellfish species which are economically valuable along our shores and those of neighboring states. Pollution and destruction of these areas by dredging, filling and drainage may be-- and appears to be-- doing damage which may be irreparable.

It appears to me that we must act now on the basis of facts at hand, in the interest of an important and vital industry, and of generations to come, and I would endorse the P.L. 88-309 projects for estuarine research, plus other interim regulations and restrictions.

/s/ William A. Shires

A RESOLUTION ON COMMERCIAL SALT WATER FISHING PROBLEMS IN NORTH CAROLINA

WHEREAS, the estuarine and oceanic waters of North Carolina represent one of our most precious natural resources, AND,

WHEREAS, these resources represent the source of livelihood and recreation for a very large number of North Carolinians, AND,

WHEREAS, these resources are being threatened by pollution of our coastal waters and by destruction of estuarine habitats, AND,

WHEREAS, there is a limited amount of sound scientific data available concerning the size and growth of fish and shellfish populations and on the effects of various fishing techniques on the numbers of individuals of available species, AND,

WHEREAS, there has been much argument concerning appropriate regulations for the management of our estuaries and for control of the taking of commercial species of fish and shellfish, AND

WHEREAS, in the opinion of the Academy much of the argument has obscured major issues and slowed the development of satisfactory regulatory procedures, NOW,

THEREFORE BE IT RESOLVED, that the North Carolina Academy of Science takes the following position with respect to major estuarine and coastal resource problems:

a. The Academy commends the Estuarine Study Committee of the Inter-Agency Council on Natural Resources for its efforts to develop satisfactory recommendations for the management of North Carolina's estuarine resources. Further, the Academy suggests that the Estuarine Study Committee consider submitting its findings to the Academy for review so that the Academy can express its opinions to State officials and to the Legislature.

b. With respect to the difficult problem of trash-fishing, the Academy finds that a serious problem does, indeed, exist and it commends the Commercial and Sports Fisheries Advisory Board for its efforts to find a solution to the problem. Because of the highly technical nature of the debate, the Academy finds itself unable to take a specific position on the issues involved. It does, however, urge that a solution be found which will permit commercial fishermen to pursue a reasonable livelihood without unwarranted destruction of juvenile fish.

BE IT FURTHER RESOLVED THAT, in view of the serious problems confronting our estuarine resources, the North Carolina Academy of Sciences urges the State of North Carolina and its agencies to develop as soon as possible appropriate procedures for the protection of all estuarine and salt water resources from destructive exploitation of any sort.

Copies of this resolution are to be sent to Governor Dan K. Moore, Director of the Department of Conservation and Development Dan E. Stewart, Director of the Department of Administration Wayne Corpening, Commissioner of Commercial and Sports Fisheries David A. Adams, and to such other State officials as may be deemed appropriate."

The hearing was concluded at approximately 1:30 o'clock p.m.

WILEY H. TAYLOR, JR.
ATTORNEY AT LAW
315 CEDAR STREET
BEAUFORT, N. C.
PARK 8-4825

October 18, 1962

Mr. Ira Morris, Jr.
Atlantic, N. C.

Dear Ira:

Inclosed are three copies of the petition you requested me to prepare. I hope that it meets your approval. If it does not return it to me with notations on what I have failed to said or have said incorrectly and I shall be glad to change it.

After you have circulated the petition and have all the names you think you can obtain, return it to me and I will send it to David Henderson with the request that he give it his support in the next session of congress. We can also have photostatic copies made and send them to the other members of the congressional delegation.

Cordially yours,

Wiley

Wiley H. Taylor, Jr.

(72)

Congress of the United States
House of Representatives
Washington, D. C.

January 21, 1963

Mr. Wiley Taylor
Attorney at Law
Beaufort North Carolina

Dear Wiley:

Knowing of your long-standing interest in the proposed project on Drum Inlet, I thought you might be interested in the enclosed copy of a letter just received from Colonel Grygiel.

If the Atlanta office of the Army Engineers approves Colonel Grygiel's report promptly and it is approved by the Rivers and Harbors Board of the Army Engineers here without undue delay, I am hopeful of getting Congressional authorization on the project this year. It is too much to hope that I could also get an appropriation this year as well, but with a little luck, we may be able to get it authorised this year and funded next year

If we are able to get things moving on the project now, I hope you fellows who have worked with Graham Barden and me on it since the early fifties will help insure that someone whose interest is much more recent does not succeed in claiming credit.

With every good wish, I am

Sincerely yours,

David N Henderson

(77)

WILEY H TAYLOR JR
ATTORNEY AT LAW
115 CEDAR STREET
BEAUFORT N C

PARK 8-4825

January 28, 1963

Mr. Ira Morris, Jr.
Atlantic, N. C.

Dear Ira:

Enclosed are copies of a letter recently received from Dave Henderson and a copy of a letter that he received from the Corps of Engineers. This would indicate that he hopes to get the Drum Inlet project approved during this current fiscal year which ends June 30, 1963, and get the money approved for next fiscal year beginning July 1, 1963. I should think this would mean the work could begin in late 1963 or early 1964. This is not definate, but a probibility.

It understand that the work on the banks will not begin until some time in 1965. There has been no money appropriated as yet and probably will not be for many months. Therefore, the type of labor is not yet a problem. I will say, however, that I shall oppose prison labor as our local people need the work badly.

Charles Harris hasn't been to Raleigh since our last converstion. We will be going soon. We will see about the lease then.

Thank you for your letter and with kindest personal regards, I am

Very truly yours,

Wiley

Wiley H. Taylor, Jr.

ATLANTIC, N. C.
MARCH [illegible] 1963

CHIEF, RIVERS, HARBORS & INLET DIV.
WILMINGTON DISTRICT
WILMINGTON, NORTH CAROLINA

DEAR SIR,

I WOULD LIKE SOME INFORMATION CONCERNING DRUM INLET, NORTH CAROLINA. DO YOU IN WILMINGTON HAVE ANYTHING ON RECORD CONCERNING THE DREDGING, JETTYING AND STONING THIS INLET? ALSO HAS ANY PROGRESS BEEN MADE TOWARDS DOING ANY OF THE ABOVE NAMED? CAN YOU TELL ME HOW MUCH MONEY IS APPROPRIATED EACH YEAR FOR THE SURVEYING OF THIS INLET? IF ANY PROGRESS IS BEING MADE WHEN WILL THE ACTUAL WORK ON THIS INLET BEGIN.

ANY INFORMATION YOU CAN FORWARD TO ME CONCERNING THIS MATTER OR ANY ADDRESS WHERE I CAN OBTAIN THIS INFORMATION WILL BE GREATLY APPRECIATED.

THANKING YOU FOR YOUR COOPERATION IN THIS MATTER, I REMAIN,

VERY TRULY YOURS,

Ira S. Morris Jr.

IRA S. MORRIS JR.

CLAUD R. WHEATLY, JR.
ATTORNEY AT LAW
DUNCAN WHEATLY BUILDING
BEAUFORT, N. C.

THOMAS S. BENNETT
ASSOCIATE

January 16, 1963

Mr. Ira Morris, Jr.
Atlantic, N.C.

Dear Ira:

I mailed the petitions concerning Drum Inlet to Congressman Henderson in Washington and told him that I knew of no concrete plans which have been presented calling for the dredging of Drum Inlet. He has answered my letter and states that a study of Drum Inlet was authorized in 1955 and that the Army Engineers held hearings in 1957 and 1961. He therefore concludes that progress is being made, although no final report has been submitted by the engineers. He further states that since his election, he has constantly been urging the Engineers to submit a report.

It would appear to me that he has not tried very hard. It has been 7 years since the study was authorized. How much time does it take? In any event you know the status of the matter at the present time. I only hope that it doesn't take another 7 years, and I will do my best to keep inquiring.

Very truly yours,

Tom

Thomas S. Bennett

TSB/

Copy mailed April

April 6, ~~March 31~~, 1963
Atlantic, N. C.

Chief, Engineering Division
Division Office
Atlanta, Georgia.

Dear Sir:

I am writing to you in regard to the drum inlet progect. I want to know if your office is [illegible] this study, which according to Congressman Henderson Mr. Barden was successful in getting an appropriation of $2,500. to make a detailed study of this project and as a result the Engineers determined that an engineering study was justified and it was begun in 1958. He states that since being elected in 1961 he has continuously urged the Army Engineers to expidite their report ..

I want to know why this has not been done and what is the hold up on the North Carolina coast that nothing can be done down here. I also want to know if more money has to be appropriated and who has to do it and where it has to come from?

ACCORDING TO CONGRESSMAN HENDERSON HIS HANDS, ARE TIED and he cabbot do anything until your report is sibmitted . According toJ. S. Grygiel on january 17th. the draft was complete and would be sent to the South Atlantic Division in a few days.

This passing the back is alright but I would appreciate full details on where the money is appropriated from and what has to be done to have this inlet cut, stoned and maintained by the engineers and who has to do this and where and when, from start to finish.

All the taxpayers get out of this is alot of campaigning and politicians elected, and 37,000 commercial fisherman in the state of North Carolina have no consideration and no representation from the Corps of Engineers to the president J.F. Kennedy.

ALL DOGS AND COMMERCIAL FISHERMAN---KEEP OFF THE GRASS

Hoping to here from you in the very near future I remain,

Yours for better engineering

Ira S. Morris Jr.

(81)

[illegible]

Atlantic, North Carolina

To the Editor:

Much has been said about the NORTH CAROLINA OUTER BANKS in the past few months, here are a few facts that have been overlooked.

From Barden's Inlet to Drum Inlet the beach has stayed somewhat the same, why, because the mainland was to the west and northwest. From Drum Inlet to Portsmouth the banks have long gone, there is nothing but an outer reef. Pamlico Sound, Pamlico River and Neuse River overflows the beach from Drum Inlet to Portsmouth. The reason for this is; in the past twenty years all the storms that have past the coast started with southerly winds, shifting to the northwest and north causing the water from the rivers and sounds to overflow the beach. Where does all the water come from that floods New Bern and all the farm land to the west and north of the coast, it comes from Barden's Inlet to Orgeon [illegible] through the Inlets and over the beach.

In the 1933 storm there was no Drum Inlet, and Ocracoke Inlet was much bigger than it is today. That was when Drum Inlet was cut and put pigs 30 feet high in the trees on Cedar Island. People lost their homes and fishermen lost their boats and gear------in Carteret in that 1933 storm. After all is said and done if the beach is built up and no Inlet is cut and stabilized, where is all the water going in the storms? There is no beach that can withstand Pamlico Sound and the rivers when they are flooded without any inlets to turn the water loose. Many times in the past twenty years I have seen the beach with six to eighteen inches of water on it for miles , when the moons became full in the fall of the year. People can't imagine what happens in a hurricane unless they have witnessed it themselves.

At Buxton they have used 58,000 sand bags and called for the second dredge, not speaking of the junk cars and other equipment that has been used to close an inlet approximately 1,500 feet.

Mr. Price wants to turn this portion on the beach over to the National Park Service. If the park service and state don't do anymore than has been done about Drum Inlet since 1933, the tide will ebb and flow in Pamlico County.

Criticism and favoritism is often spoke of, but we have a reef and that is all it amounts to and the sea waits for no man, so we will wait for another year and let the time go by.

Reproduced from best available copy.

BOX 23
ATLANTIC, N.C.
285II

MR. UDALL, DEPT. OF INTERIOR
WASHINGTON, D.C.

MR. SECRETARY:

I AM A RESIDENT OF ATLANTIC,N.C. AND HAVE BEEN A COMMERCIAL FISHERMAN FOR THE PAST TEN YEARS. I HAVE COMPLETED A COURSE OF TWO YEARS IN MARINE TECHNOLOGY AT CAPE FEAR TECHNICAL INSTITUTE.

I HAVE ALWAYS BEEN INTRESTED IN CONSERVING OUR NATURAL RESOURCES. I READ ABOUT THE COASTAL WATER CONDITIONS HEARING WHICH WAS HELD IN NEW BERN, N.C.ON JULY 26TH., BUT COULD NOT ATTEND THIS HEARING BECAUSE I WAS STILL IN SCHOOL.

THE GENTLEMAN REPRESENTING THIS AREA, GAVE A VERY MISLEADING ACCOUNT OF THE CONDITIONS OF THIS AREA, WHICH COULD LEAD TO VERY GRAVE CIRCUMSTANCES. THIS MATTER NEEDS YOUR ATTENTION IMMEDIATELY OR ONE OF THE MOST IMPORTANT ESTURINE AREAS OF THE EAST COAST WILL BE RUINED.

AS YOU PROBABLY ALREADY KNOW, JUVINILE FISH ARE PRODUCED AND GROW IN THE ESTURINE AREAS IN THE WARM SUMMER MONTHS, THEN MIGRATE TO THE OCEAN IN THE COLDER MONTHS.

THE ONLY INLET IN EITHER DIRECTION, WITH DISTANCES FROM TWENTY FIVE TO THIRTY MILES IS RAPIDLY CLOSING UP.

IT DOSENT SEEM LIKE MUCH, BUT IT IS LIKE A LIFE TIME TO A BABY FISH AN INCH OR SO LONG TRYING TO SWIM A GREAT DISTANCE. I AM SENDING A CHART TO GIVE YOU A BETTER UNDERSTANDING OF THE INLET, WHERE IT WAS, WHERE IT IS NOW. AND WHY IT IS SO IMPORTANT.

IT HAS BEEN ABOUT TWENTY YEARS SINCE DRUM INLET HAS ~~B~~ BEEN DREDGED AND THEN IT WAS NOT OPENED IN SUCH A MANNER, AS TO KEEP THE COST OF UPKEEP TO A MINIMUM. IF IT HAD BEEN DREDGED CORRECTLY, IT WOULD HAVE KEPT ITSELF OPEN.

IT IS THE ONLY AREA, THAT I KNOW OF, WHERE THE PEOPLE PRAY FOR A HURRICANE TO COME AND OPEN THE INLET.

HERE ARE SOME REASONS FOR THE NEED OF ATTENTION OF THIS AREA:

I. IT WOULD HELP TO DILUTE THE ESTURINE WATER WITH SEA WATER AND HELP LOWER THE POLLUTION MARK.

2. IT WOULD OPEN UP A WHOLE NEW UNCROWDED RECREATION AREA TO THE PUBLIC.

3. IT WOULD INSURE A LARGER, MORE HEALTHY REPRODUCTION AREA FOR SEA LIFE.

4. IT WOULD GIVE ON OF THE STATES MAJOR INDUSTRIES, A CHANNEL TO THE SEA. (TEXAS GULF SULPHERCO.)

5. IT WOULD INCREASE THE STANDARD OF LIVING IN THIS AREA, TO WHICH THERE WOULD NOT BE AS GREAT A NEED FOR WELFARE.
6. IT WOULD GIVE THE COMMERCIAL FISHERMEN A CHANCE TO HARVEST MORE FROM THE SEA AND TAKE THE MAJOR STRAIN OFF THE ESTURINE AREA.
7. IT WOULD HELP CONSERVE THE NATURAL RESOURCES WHILE THERE IS STILL TIME, IF THIS DREDGING OF DRUM INLET COULD BE ACCOMPLISHED.

PEOPLE INTRESTED IN HAVING THIS INLET DREDGED HAVE TRIED EVERY MEANS POSSIBLE, BUT WITH NO SUCCESS. THEY EVEN GOT UP PETITIONS TO THE EXTENT OF 2500 SIGNATURES IN FOUR COUNTIES, WHICH WERE CARTERET, CRAVEN, BEAUFORT, PAMLICO. IT WAS GIVEN TO CONGRESSMAN HENDERSON(SEE COPY OF THE LETTER) AND BY THE FISH DEALERS IN THE EASTERN PART OF NORTH CAROLINA, SPECIFICALLY CARTRET COUNTY AND CLAYTON FULCHER JR., MR. HENDERSON WAS TOLD THE SIGNATITURES WERE FORGED AND THERE FORE NOTHING WAS DONE. YOU SEE DUE TO THE POLITICAL PARTY IN THIS COUNTY WE CANNOT HAVE ANYTHING.

HERE ARE SOME REASONS THE INLET HAS NOT BEEN DREDGED

I. THE FUNDS WHICH HAVE BEEN APPROPRIATED TO HAVE IT CUT HAVE SOMEHOW FOUND THEIR WAY INTO OTHER AREAS IN THIS DISTRICT.
2. LOCAL DEALERS, (POLITICANS IN CONTROL OF THE AREA), ARE AFRAID THAT COMPETITIVE BUYERS WILL MOVE IN OR THAT THE FISHERMEN WHO RUN THEIR BOATS WOULD QUIT TO TAKE THE BETTER JOBS THIS PROJECT WOULD BRING ABOUT AND THEY WOULD NOT BE ABLE TO HOLD THEM IN THE CLOSE TO POVERTY BRACKET THAT THEY HAVE HELD THEM AND THEIR FATHERS BEFORE THEM. IF THEY CAN KEEP CONTROL FOR TEN MORE YEARS , THEY WILL BE ABLE TO RETIRE AND THE AREA WILL BE DEPLETED TO THE POINT THAT IT WILL TAKE YEARS TO RESTOCK THE SOUND, WHICH WILL ONLY BE DONE BY THE INLETS OPENED OR ELSE THE GOV. WILL HAVE TO DECARE IT A POND AND RESTOCK IT FOR US. MR. UDALL WITH 36,000 COMMERCIAL FISHERMEN AND THE UNKOWN QUANTITY OF SPORTS FISHERMEN IT WILL TAKE QUITE A LARGE AMOUNT OF FISH TO STOCK NORTH CAROLINA, WHICH WITH DRUM INLET OPENED IT WOULD DO SO ON ITS OWN.
3. LACK OF EQUAL REPRENSTATION.
4. MISINFORMED PUBLIC.
5. OUR FEDERAL REPRESENTATIVES DO NOT CARE ABOUT OUR NATURAL RESOURCES, ONLY THEIR FRIENDS.

6. DISCRIMINATION AND PERSECUTION OF ANYONE WHO TRIES TO GET ANYTHING DONE TO PRESERVE OUR DISAPPEARING NATURAL RESOURSES, UNLESS IT IS TO THEIR OWN PROFITATION.
7. SOME PEOPLE SAY THAT THE LARGE CHANGE IN TEMP. AND SALINITY WOULD UPSET THE AREA , BUT IT IS A PROVEN FACT, THAT ESTURINE ANIMALS CAN STAND THE CHANGE.
8. THE STATE IS TRYING TO CLOSE IT TO PLEASE A CERTIN PERSON

I REALIZE THAT A MAN IN YOUR POSITION HAS TO BE VERY CAREFUL IN WHAT HE SAYS AND DOES AND THAT THERE ARE ALOT OF TENGS GOING ON THAT YOU DO NOT HEAR ABOUT,YOUR ACTING NOW WILL BE THE LAST HOPE OF A LOT OF PEOPLE.

I AM ASKING YOU TO SEND A PERSONAL REPRESENTATIVE TO INSPECT THIS AREA.I WILL GLADLY SHOW HIM THE AREA. I AM SURE THAT ANY TIME OR EFFORT WILL BE WELL WORTH WHILE.

I HOPE THAT YOU WILL ACT WHILE THERE IS STILL TIME TO CONSERVE THE DISSAPPERRING RESOURCES OF THIS AREA.I WILL BE IN ATLANTIC, N.C. ANY TIME AND I WILL BE EAGERLY AWAITING AN ANSWER FROM YOU.

YOURS FOR BETTER CONSERVATION

MILTON COOPER MASON
Milton Cooper Mason
BOX 23

ATLANTIC, N.C. 28511

Wallace Fisheries Company

Morehead City, N. C.

July 22, 1968

Mr. Lloyd W. Gebhard
Regional Director
U. S. Dept. of the Interior
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Gebhard:

Acknowledging yours of June 21, I shall be unable to attend the meeting in New Bern scheduled for July 26.

We no longer have a plant operating in North Carolina but at the time we were we had our plant cleared through the proper authorities of North Carolina for operation as we had eliminated any pollution of coastal waters.

I am not an expert, but my concern is the closing of estuarine waters through dredging and making land developments. There are various types of marine life that use these estuarine waters as nurseries or hatcheries and the amount figured in dollars and cents would be very hard to estimate. I am not a believer in big government and more regulations than we already have for we have too many, but the North Carolina Department of Water & Air Resources should be consulted prior to any more filling of marshes or any estuarine waters. There has been entirely too much of this in the wetlands of the Eastern seaboard from Maine to Key West and it is my personal opinion that this is one of the great reasons for the decline of the fishing industry on the Atlantic seaboard.

It is well enough to require industry, etc., along the seaboard to do away with water and air pollution but it is just as important to have the upstream industries and towns to do away with pollution as it is far more prevalent than just along the seaboard.

I do appreciate the invitation to attend this meeting and hope that it will be of benefit.

Yours very truly,

WALLACE FISHERIES COMPANY

George R. Wallace
President

cc: Mr. George E. Pickett
Director, N. C. Dept of
Water and Air Resources

(56)

THE NORTH CAROLINA WILDLIFE FEDERATION, INC.
AFFILIATED WITH THE NATIONAL WILDLIFE FEDERATION
P O BOX 948 ROCKY MOUNT, NORTH CAROLINA TELEPHONE: AREA 919 - GI 2-2212

1707 Fisher Street
Morehead City, N. C.
July 16, 1968

United States Department of the Interior
Federal Water Pollution Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Gentlemen:

I'm in receipt of your letter of June 21, 1968, reference the effects of pollution in the estuarine zones of the United States on fish and wildlife, sport and commercial fishing, recreation, water supply, water power, and other beneficial uses.

To the writer, it would seem that the greatest sources of pollution in the estuarine areas are caused by the following:

1. raw and untreated sewage
2. Industrial waste
3. land fill and development
4. drainage

1. Untreated sewage, more and more cities, towns, and villages have programs underway to treat and properly dispose of raw and untreated sewage, maximum effort must be continued to eliminate this source of pollution, results are very encouraging too date. Military cantonments in the eastern part of North Carolina, particularly the two marine bases, Camp Lejeune and Cherry Point, are very serious violators of improper sewage disposal. Their sewage disposal systems are totaly inadequate and should very definitely be modernized and expanded.

Pollution caused by number 2, industrial waste, has in the case of North Carolina, been very actively taken under investigation. There are many of the older industries, utilities, and etc. that have taken partial steps towards controlling their wastes, both as to water and air pollution. Further steps should be taken to correct the situation, in so far, as established industries are concerned, and very strenuous controls should be set forth as guide lines for new industries. These controls must be strictly enforced.

One of the primary sources of dissipation of estuarine areas is the development and land fill of the marshes and other estuarine bottoms, by developers of real estate, marina's and etc. Some system of zoning to protect existing estuarine areas and marine nursery grounds should be set-up, strenously enforced. Marsh and swamp lands are being used up at an ever increasing rate.

Land drainage, particularly in the case of farm drainage, adds many pollutants to our creeks and streams, which in turn pollute our sounds and oceans, destroying our estuarine areas by large deposits of mud and silt, plus high concentrations of insecticides and pesticides, that are toxic in substance. It seems ridiculous that our government on one hand is encouraging retirement of crop land from production and at the same time encouraging more crop land through subsidy for drainage purposes. In many areas drainage is also encouraged for mosquito control. This type of drainage is very needed and the writer would suggest, that the establishment of compounds, would serve this purpose in a much more beneficial manner than just the digging of canals and ditches in a haphazard fashion.

Incidental to the pollution of estuarine areas in the Coastal sections of North Carolina is the fact that bilges of oil tankers and other ships are cleaned out while the ships are in port, causing the discharge of oily waste and materials in the ocean, sounds and tributaries, effecting the marine nursery areas by the resultant scum effecting the content compound in the water. The estuarine areas are also effected by the litter thrown overboard by the operators of all varieties of marine craft and the discharge of waste from these crafts.

Sincerely yours,

Walter Teich
WALTER TEICH

WT:rb

Statement of Forest Service Policy With Reference To Water Pollution Problems In Estuarine Areas of North Carolina

Presented At Federal Water Pollution Control Administration Hearing
New Bern, N. C., on July 26, 1968
By Peter J. Hanlon, Forest Supervisor
National Forests in North Carolina

It shall be the policy of the Forest Service, Southern Region, to retain, safeguard, and preserve National Forest owned estuaries, and, within its jurisdiction, take steps to protect these valuable biological and recreational areas from encroachment, pollution, damage, or destruction by man-made forces. Furthermore, the Forest Service shall cooperate with interested agencies and organizations in all reasonable efforts to restore and rehabilitate National Forest estuaries presently in a damaged condition. The Forest Service shall observe such principles of watershed management, pest control, and land use development on National Forest holdings within the watersheds of estuaries as are necessary to protect such estuarine areas regardless of condition or ownership status.

July 26, 1968

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best available copy.

Federal Water Pollution
Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Va 22901

Gentlemen:

We are talking about wise use of our estuaries, preservation of certain areas and optimum use of others, without adverse effect on surrounding land and water. We are talking of sharing our resources.

Some of the major sources of danger are pollution of upstate streams, by industry particularly: manufacturing by-products, acids and other chemicals, heavy metals and oxygen-reducing materials. Also of growing concern is the matter of thermal pollution.

Another great danger is from new industries, as mining, which uses vast acreage in land fill or removal, plus the possible alteration of the chemistry of the estuarine environment. Further, a great unknown effect comes from herbicides, pesticides and fertilizers entering the watersheds.

The clear and present danger is land alteration, which endangers the estuaries through real estate and industrial development, navigation, drainage, highway construction, mosquito control and flood control.

Strict controls must be enforced. Zoning is the first step. In present society a permit is necessary to alter or construct a home. This permit system can well be extended to real estate and industrial development, particularly as it affects any watershed or estuarine area.

Because it is necessary to provide homes, build roads, dig ditches and otherwise alter land, a system of reclaiming altered land should be developed. Spoil banks could be constructed in such a way as to enhance marine growth. Research on planting of beneficial grasses and cover plants should be encouraged. Channel design could perhaps be improved, siltation and erosion controlled.

The horrible examples of altering rivers under the guise of flood control is classic. The usual method is to run a dragline upstream with no regard for natural features. The same benefits could often be obtained by simply removing logs and obstructions without the digging operations. Every alteration permit must include rehabilitation features.

Non-industrial uses of the estuaries need to be given more consideration. Hunting, fishing and recreational uses of the estuaries are now major sources of income to coastal areas. Commercial and sports fishing mean about $60 million annually to North Carolina; hunting and boating figures would boost this figure by another substantial amount. Goose hunting alone amounts to more than one-half million dollars. More than 3,000 non-resident yachts cruise in North Carolina waters every year.

Land acquisition is of utmost importance. Key areas most valuable to the estuarine program must be obtained by the State, with Federal assistance where required, to be zoned with reversionary clauses guaranteeing their continued proper use.

We must encourage waste control programs, making no exceptions for any industry or municipality. Further research on pesticides, herbicides and fertilizers is urgently needed. Along with these activities, higher water standards for the major watersheds must be invoked.

We are faced with a last-ditch stand in behalf of our estuarine resources. It is a vanishing frontier that we cannot afford to despoil further.

Respectfully,

Bob Simpson

CURRITUCK SOUND

REHABILITATION COMMITTEE

Route 1, Moyock North Carolina

22 1968
SECTION
FWPCA

July 17, 1968

Mr. Lloyd W. Gebhard, Regional Director
Federal Water Pollution Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Gebhard:

Thank you for your letter of June 21. I regret that I will be unable to attend this meeting on pollution problems in the Nation's estuarine areas. However, I would like to present briefly the problems in northern Currituck Sound and hope this information can be included in the records of the meeting.

The salinity and pollution in Currituck Sound, N. C., is of great concern to many of our local residents. The Currituck Sound Rehabilitation Committee is interested in solving these problems and in the general improvement of our area.

Our group believes that one of the best ways to increase the economic potential of Currituck County is through the introduction of more salt water into the northern part of Currituck Sound. We further believe that the most useful and economical means of accomplishing this would be through a small inlet across the narrow beach which separates the Sound from the Atlantic Ocean. The northern part of the Sound is suggested as the proper location for an inlet because this area has the lowest salinity in the entire area.

As a result of a joint Virginia-North Carolina study from 1958 through February, 1962 (headed by Mr. John L. Sincock, Chief, Section of Wetland Ecology for the Department of the Interior, Fish and Wildlife Service), it was determined that the average salinity in northern Currituck Sound is 2 to 3 per cent; the middle portion, 4 to 6 per cent; and the southern end varies widely but generally averages about 10 per cent.

In October of 1965 I wrote Mr. Sincock and asked him for information about the joint study. In reply he sent me five volumes of data accumulated during the study. This data confirmed what the long-time residents of northern Currituck already knew--there is not enough salinity in this section to grow the aquatic plants necessary to attract and feed wildfowl. The growth of aquatic plants, in addition to feeding wildfowl, will tend to calm the water along the shores during high tides and thus help prevent soil erosion. Erosion is a very real problem to the property owners, for it not only takes their land but also causes turbidity in the water, which prevents plant growth.

The problems of land erosion and water turbidity were greatly increased by the installation of locks at Great Bridge, Virginia, in 1932. This closed the northern water outlet, thereby causing high tides to wash the shore lines whenever the wind is in the southern sector. The lack of a northern outlet also prevents the flow of salt water to the north portion of the Sound.

During the fall of 1965, we circulated petitions in the County and obtained 949 signatures of qualified voters or property owners who stated that they were in favor of increasing the salinity in northern Currituck Sound--preferably by an inlet.

However, there are those in the County and, I understand, at the State level who are opposed to additional salinity due to the fresh water fish involved. It is recognized that the salinity in an area around the mouth of a small stabalized inlet would be too high for fresh water fish. It is believed, however, that there would be sufficient area both north and south of the inlet and up the creeks and rivers with a salinity content low enough (13% sea strength) to provide ample fresh water fishing and, at the same time, provide salt water fishing in the inlet area. An inlet would also provide sport fishermen with access to the Ocean and some of the best salt water fishing on the East Coast.

For the reasons heretofore mentioned, it is respectfully requested that your study include the feasibility of the proposed inlet. This Committee believes that the following benefits would be derived:

a. Increase the salinity, thereby supporting the growth of more grass for waterfowl.

b. Help to prevent high tides and thus reduce turbidity and soil erosion.

c. Provide both fresh and salt water fishing in Currituck Sound.

d. Provide access to the Ocean and salt water fishing.

e. A combination of a, b, c, and d would attract more tourists due to better hunting, variety of fishing available, and cleaner water for water sports (such as skiing and swimming).

This, we believe, would greatly increase the economic benefits of the entire area.

The average salinity, lack of aquatic plants, high turbidity, and the need for increased salinity in northern Currituck Sound are documented in the joint Virginia-North Carolina study of which I am sure you have a copy.

When the study is being made, this Committee would welcome the opportunity to talk with those concerned and show them first hand some of the existing problems. I find it difficult to describe the problems fully in writing and believe that an on the scene description would be beneficial. Should you like to contact a member of this Committee, please call:

J. M. Pritchard	453-2605
V. F. Creekmore	453-2605
J. W. Tice	453-2602

The above live on the west side of the Sound, north of Currituck Courthouse. Living on the east side at Knotts Island:

H. H. Waterfield	429-6875
Harold Capps	no phone.

Enclosed is a copy of a letter from the Currituck County Commissioners supporting this Committee in efforts to secure more aquatic vegetation.

The beliefs of this Committee are based on the facts obtained from the joint study and also from the fact that long-time residents have seen the vast decrease in fish and vegetation with the decrease in salinity.

Sincerely yours,

J M Pritchard

Joseph M. Pritchard
Secretary

JMP/jpl

Enc.

January 5, 1967

W. T. Culpepper, Jr.
District Representative
c/o Culpepper Hardware Store
Elizabeth City, N.C.

Dear Mr. Culpepper:

As Clerk to the Currituck County Board of Commissioners, I am instructed to advise you that at the regular meeting of the Board on Tuesday, Jan. 3, 1967, it was unanimously decided that our said Board does and will support the Currituck Sound Rehabilitation Committee in its effort to secure action on the part of the N.C. Wildlife Resources Commission, N.C. Dept. of Conservation and Development and the U.S. Dept. of the Interior Fish and Wildlife Service looking toward increasing the duck feed and vegetation in the Northern section of Currituck Sound.

The Board therefore urges that such steps be taken as will hasten this result.

Sincerely yours

William Brumsey Jr.
Clerk to the Board
Currituck, N.C.

Copy to:
N.C. State Wildlife Commission
N.C. Dept. of Cons. & Dev.
U.S. Dept. of Interior
Chairman of N.C.Wildlife Commission
George N. Wood, State Senator
O. L. Woodhouse
J. M. Pritchard
James Tice

(96)

COMMENTS PREPARED BY THE WATER SUPPLY AND SEA RESOURCES PROGRAM, PUBLIC HEALTH SERVICE, REGION III, PRESENTED AT THE PUBLIC MEETING ON POLLUTION PROBLEMS ASSOCIATED WITH ESTUARINE AREAS, JULY 26, 1968, AT NEW BERN, NORTH CAROLINA

As requested in a letter of June 21, 1968 from Mr. Lloyd W. Gebhard, Regional Director, Middle Atlantic Region, Federal Water Pollution Control Administration, to Dr. Emil E. Palmquist, Regional Health Director, Public Health Service, Charlottesville, Virginia, the following comments concerning "Pollution Problems Associated with Estuarine Areas" are respectfully submitted.

For more than forty years, the Public Health Service has been involved in the National Shellfish Sanitation Program in cooperation with the States, other federal agencies and the shellfish industry. The major objective of this Program is to assure continued safe use of shellfish for human consumption and to encourage water quality programs which will preserve potential shellfish producing areas for this beneficial use.

The principal roles of the Public Health Service in the Program are to provide leadership and to coordinate federal and State shellfish sanitation activities, to conduct annual evaluations of each State's Program and supply a semi-monthly list of all valid interstate shellfish shippers to health authorities and others concerned.

On September 1, 1966, President Johnson approved an Interdepartmental Agreement between the Department of Health, Education, and Welfare and the Department of the Interior. This Agreement sets forth the responsibilities of the two Departments in the field of water pollution control. Under this Agreement, the Surgeon General of the Public Health

Service shall provide consultation, advice, and assistance relative to the health aspects of water pollution especially as it affects man's drinking water; water contact in recreation and work; to the contamination of food sources, particularly shellfish; and to specific insect vectors of disease.

In reference to the protection of shellfish growing waters, it has been agreed that upon request from the Federal Water Pollution Control Administration, the Public Health Service would review and provide advice on construction grant applications for waste treatment facilities and federal installations whose operation may adversely affect shellfish growing waters. In such reviews, the Public Health Service, in cooperation with the State shellfish control authorities, provides the Federal Water Pollution Control Administration with information regarding the species, quantity of shellfish, and the location of the beds in relation to the treatment facility outfall with comments concerning the effects which might be expected to the growing areas. Recommendations are also made to incorporate in the severage system design criteria, devices and safety features which may be expected to provide maximum reliability for uniform quality of the effluent of the waste treatment plant.

The Public Health Service works in close cooperation with the North Carolina State Board of Health and other responsible State agencies to establish adequate water quality management to provide maximum approved areas for shellfish harvesting and to obtain optimum-protection to the estuaries for other usage as defined by the North Carolina Department of Water and Air Resources.

NORTH CAROLINA STATE UNIVERSITY

SCHOOL OF FORESTRY

Box 5488 Zip 27607

July 19, 1968

JUL 22 1968
SECTION
FWPCA

Mr. Lloyd W. Gebhard, Regional Director
Federal Water Pollution Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Dear Lloyd:

Thank you for your letter of June 21, 1968 and the invitation to appear and present a statement on estuarine pollution at the public meeting to be held in New Bern, North Carolina on Friday, July 26, 1968. Unfortunately, I suffered a coronary acclusion on May 31 and even though I am progressing quite well, my doctor will not permit me to go to my office or travel at this time. I sincerely regret that I will be unable to attend the New Bern hearing, for as an ecologist I am increasingly concerned with the rapid acceleration in the degradation of our environment and particularly in our inland water and estuarine areas. Since I cannot appear in person I wish to have this letter with the attached editorial and cartoon (THE NEWS AND OBSERVER, Raleigh, North Carolina, 16 July 1968) made a part of the official record of the July 26 hearings.

The estuarine problem may be divided into two aspects: (1) what is happening upstream and (2) what is occurring locally - neither phase can be considered separately. My comments will deal, therefore, with both aspects of the problem. Having devoted the past 21 years in working for the improvement of our environment and for adequate pollution controls, I find myself in complete and enthusiastic agreement with Secretary Udall's guidelines for the protection of our existing water quality and for the abatement of existing pollution. I am well aware of the complexities of the pollution problem (BS Chemistry, Georgia Tech.; MS, Ph.D. Zoology, University of Michigan) since I have spent the greater part of my professional career in training and research with several hundred students majoring in many facets of game, fish, and aquatic biology as well as marsh ecology.

I have become increasingly more discouraged with the pitifully inadequate efforts by the responsible state agencies to combat the pollution of our environment. It is certainly no secret that we have a greater tonnage of pollutants (some being far more toxic) reaching our sounds and estuaries today than we had two decades ago. The sad fact is that these conditions will continue to worsen under our present state laws and the current board policies of the Department of Water and Air Resources. I find myself in reluctant but complete agreement with the statement in the attached editorial:

> "North Carolina has rocked along in ho-hum fashion for years with a pollution control program which may well prove worse than no program at all."

During the past 21 years I have spent a great deal of time and effort talking with legislators, elected and appointed officials in state government about the pollution of our streams and estuaries and the destruction of our marsh environment. As a result of these discussions, I am of the opinion that despite the high quality of professional biologists and sanitary engineers employed by the State of North Carolina in the natural resource area, their numbers are totally inadequate to cope with the pollution problem even if we had laws and board (Water and Air) policies that were adequate to support a bona fide pollution control program. It should be apparent to all that little or nothing is likely to be done by any of the states to effectively insure the maintenance of the present quality of their public waters and particularly the sounds and estuaries. If anyone thinks otherwise, let them examine the record of pollution abatement in the various states and also let them read the resolution passed at the recent Governors' Conference concerning Secretary Udall's water-quality guidelines.

Since the alleged reasons given by the states for not forcing industry to clean up its wastes is that industry will not come to them, will leave the state or will go out of business, the obvious solution is to have strict federal controls not only on interstate but intrastate pollution thus protecting both the states' and industrys' interest.

I urge the adoption of strong and uniform federal pollution control regulations for inland waters, tidal marshes, sounds and estuaries. Thank you for the opportunity to testify on this important matter.

Sincerely yours,

F. S. Barkalow

F. S. Barkalow, Jr.
Professor of Zoology and Forestry

FSB:csp

Attachments 2

cc Colonel George E. Pickett

(100)

The News and Observer
"THE OLD RELIABLE"
Published Every Morning in the Year By
THE NEWS AND OBSERVER
PUBLISHING COMPANY
215 S. McDowell St.
Raleigh, N. C. 27601

Tuesday, July 16, 1968

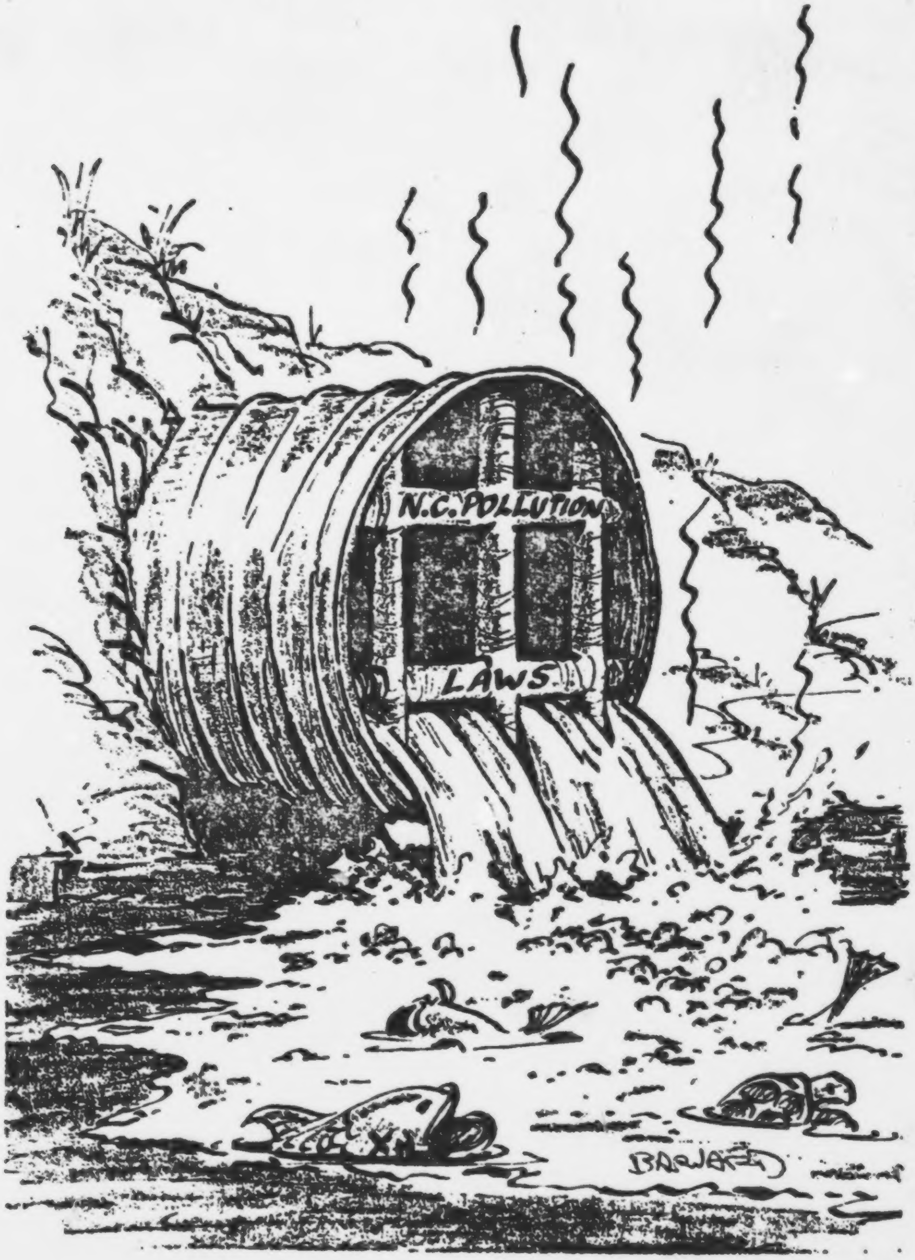
River Killing

As thousands of fish float belly-up for 20 miles along the Northeast Cape Fear River, an incredulous public must ask not only who is responsible but what their State government is doing to prevent these recurrent killings of wildlife and great segments of public waters. The immediate fish kill is sickening, both figuratively and in fact. The species eradicated included striped bass weighing as much as 30 pounds, yellow perch, bluegill, mullet, flounder and large-mouthed bass. Even river reptiles, turtles and snakes, were wiped out. And this extraordinary blow only dramatizes the injury to the river and the estuarine area where the river meets the sea. Water unfit for fish life is dangerous to public health, unusable as a public raw water supply and farm irrigation and maybe unfit even for industrial reuse. The denuder or careless exploiter of such a great resource must indeed be found out and punished to the fullest extent to the law. If for any reason the State Department of Water and Air Resources is unable to quickly complete an investigation revealing the cause and source of pollution, it should not hesitate to seek help from biologists and researchers in other State agencies.

North Carolina has rocked along in ho-hum fashion for years with a pollution control program which may well prove worse than no program at all. The law has been touted as enlightened when, in fact, it has sanctioned the measured fouling of public rivers and streams — only partly arresting pollution while actually bringing much of it under protection of the statutes. The reshaping of this control effort by the last session of the legislature was a campaign vehemently opposed by industrial polluters who daily dump untreated or inadequately treated chemical wastes into public waters. They have simply cared too little that these are public waters, and even that future industrial growth is dependent upon the wise conservation of them.

The fish kills traced to such polluters in the past were never intentional. But they were accidents in an area of public protection and conservation where the law has been weak and the punishment slight. Behind the dramatic accidents, usually by an industry, occasionally by a vicious individual, has been a policy permitting long term pollution which poisons public waters to a degree only less obvious. The polluter in this case, whether industrial, municipal or individual, must be found out and forced to pay the costs levied under the law. But the greater lesson to be learned from this river killing is North Carolina's need for more effective law and effective enforcement to discourage recurrences in the future.

The News and Observer, Tuesday, July 16, 1968


N.C. POLLUTION
LAWS
BARNARD

(102)

Jane

NORTH CAROLINA STATE UNIVERSITY | AT RALEIGH

SCHOOL OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING
Box 5993 Zip 27607

July 17, 1968

Messrs. Lloyd W. Gebhard
and George E. Pickett
Federal Water Pollution Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Re: July 26 Public Hearing on Estuaries at New Bern, North Carolina

Gentlemen:

The Sounds of North Carolina cover an area of approximately 4500 square miles at an average depth of 15 feet. The introduction of any substantial amount of pollution into these sounds promises to defile them in a period of time much less than the approximately fifteen years that degraded Lake Erie almost beyond recall.

Studies at N. C. State University in the Department of Civil Engineering have concerned the hydraulic and hydrologic factors that influence the capacity of the Sounds to assimilate pollution. A significant fact that has emerged that it takes approximately three months for a unit of pollution to flush through the Pamlico Sound and into the Sea. The practical significance of this fact that virtually all natural purification takes place in the Sound itself. The thought that pollution will be carried through several inlets and dispersed in the Atlantic Ocean is wishful thinking.

The actual assimilation capacity of the Sounds is not known though several studies directed to an estimate of that capacity are underway.

If we view the Sounds as a vast natural lagoon for the treatment of sewage and apply a conventional standard of 100 persons/acre of lagoon, then a superficial estimate would suggest that the Sounds could assimilate the wastes of 288 million persons. It must be recalled, however, that such a usage would deplete the water of its oxygen and preclude its use for any other purpose. In fact habitation of the coastal region would be only for those with no sense of smell and for those who have no objection to open septic tanks in their front yard.

The prolonged flushing time of the Sounds also suggests that the waters have a very substantial capacity for self-pollution. That is, given appropriate introduction of fertilizing elements such as nitrogen and phosphorous then the growth of algae and their subsequent death before flushing to the ocean will give rise to an accumulation of organic matter that will not be significantly different from human pollution. The process is now known as "Eutrophication."

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The process, in fact, accounts, in part, for the substantial natural productivity of the Sounds for fish and other marine life. Eutrophication, however, is a slow process that is accelerated by the addition of human and industrial pollution. In fact, processes that take hundreds of years to occur naturally take place within a single human generation, i.e., Lake Erie.

There is little question in my mind that the development of the human and natural resources of the coastal region surrounding the Sounds is a desirable objective of public policy. However, the wastes from a population equivalent of even one percent of the 288 million noted above will almost certainly deteriorate the quality of the water in the Sounds below standards satisfactory for a fishing or a recreation industry.

It is incumbent upon the State of North Carolina to make determinations of the assimilation capacity of the Sounds for pollution and to adopt regulatory policies that will permit the development of the economy of the region without deterioration of the waters. Unrestricted exploitation of the waters would result in rapid deterioration of the quality of the water with serious damage to recreation and to both sport and commercial fisheries and no long range benefits to either the region or the State of North Carolina.

I regret that I will be unable to be in New Bern on July 26, 1968, but trust that these remarks will be of some value to you.

Sincerely,

Charles Smallwood Jr

Charles Smallwood, Jr., Professor
of Civil Engineering

CS:bt

West Virginia
Pulp and Paper
Timberlands Division

RECEIVED
JUL 29 1968
OFFICE SERVICES
SECTION
FWPCA

July 26, 1968

Mr. Lloyd W. Gebhard, Regional
Director
United States Department of the
Interior
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Gebhard:

Thank you for the opportunity of preparing a statement relating to estuarine management in North Carolina. I will not be able to attend the New Bern Meeting, but would like to indicate our support of the statement submitted by the Dare County Board of Commissioners - "Needs for Estuarine and Pollution Studies in the Upper Sound of the State of North Carolina and especially Areas of Dare County".

Westvaco owns 300,000 acres of timberlands located mainly in Tyrrell and Dare Counties. The Dare property borders the Croatan and Pamlico Sounds and does contain a significant acreage of needlerush marsh. Our current development embraces principally road and canal construction for access and drainage, land conditioning for farming and timber production, and certain game management practices as part of our recreational planning.

The Company would be vitally concerned with any estuarine studies and controls that might influence the development of these properties along these lines:

(1) Forest drainage to increase timber productivity.

(2) Farm crop production on a part of these organic soils to increase profitability.

(3) Impoundment of certain marsh areas jointly with N. C. Wildlife Commission to improve waterfowl habitat and to enhance public hunting opportunities on these lands.

North Carolina Woodlands
P. O. Box 307, Manteo, North Carolina 27954
Area Code: 919 473-2138

(4) Development of certain waterfront properties for sale as vacation home sites.

We applaud the efforts of the Department of Interior in undertaking these estuarine studies and assure you that we are working closely with the County governments and State wildlife and recreation agencies on the wise development of this valuable wetland resource. If we can be of further assistance, please feel free to call on us.

Sincerely,

WEST VIRGINIA PULP AND PAPER

Quentin Bell

By Quentin Bell, Manager
North Carolina Woodlands

QB:dfe

CC - George E. Pickett

(106)

Gordon

North Carolina General Assembly
House of Representatives
State Legislative Building
Raleigh

ROBERTS H. JERNIGAN, CHAIRMAN
COMMITTEE ON CONSERVATION AND DEVELOPMENT
HOME ADDRESS: 401 N. CURTIS STREET
AHOSKIE, N. C.
6TH DISTRICT

COMMITTEES:
APPROPRIATIONS, VICE-CHAIRMAN
PRINTING, VICE-CHAIRMAN
WATER RESOURCES AND CONTROL, VICE-CHAIRMAN
AGRICULTURE
EDUCATION
HIGHWAY SAFETY
ROADS

July 10th, 1968

Mr. Lloyd W. Gebhard, Regional Director
Federal Water Pollution Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Gebhard:

Many thanks for your letter inviting me to appear at a public hearing Friday, July 26th, at the Courthouse in New Bern, North Carolina. I very much wish I could attend but I already have a prior commitment. I am vitally interested in the subject which will be discussed as I have already requested the North Carolina Department of Water and Air Resources to give me full data on the pollution problem of the Chowan River. The Department has **compiled**, what I think is a very good report concerning the condition of this river. The North Carolina Wildlife Resources Commission has also been working on the pollution problem of this river and I hope and feel that they will soon release details of how this problem can be brought under control.

In the report released by the Department of Water and Air Resources and also in a letter that I have received from Colonel Patton of the Wildlife Resources Commission, both agree that the greatest pollutor of the Chowan River is the Union Camp Mills in Franklin, Virginia. Both agree that the pollution from this Mill is causing the fish to leave the river at certain times of the year, but they also point out that normally residue from Paper Mills does not usually react on the fish as is occuring in the Chowan River. This is where more study is needed.

I strongly feel that once certain facts are determined Union Camp and other less pollutors of the Chowan River will do all possible to bring this problem under control. We of course, welcome any help which we might receive from the Department of Interior, however, I hope and feel that the proper authorities in North Carolina and Virginia and the pollutors themselves -

rec'd 7/15

(107)

North Carolina General Assembly
House of Representatives
State Legislative Building
Raleigh

ROBERTS H. JERNIGAN, CHAIRMAN
COMMITTEE ON CONSERVATION AND DEVELOPMENT
HOME ADDRESS: 401 N. CURTIS STREET
AHOSKIE, N. C.
6TH DISTRICT

COMMITTEES:
APPROPRIATIONS, VICE-CHAIRMAN
PRINTING, VICE-CHAIRMAN
WATER RESOURCES AND CONTROL, VICE-CHAIRMAN
AGRICULTURE
EDUCATION
HIGHWAY SAFETY
ROADS

all working together can control this pollution problem. If not I will certainly be in contact with the proper authorities on the Federal level.

With kind regards, I remain,

Sincerely,

Roberts H. Jernigan, Jr.

EDGAR L. YOW
CICERO P. YOW

DIAL 762-2422
AREA CODE 919

YOW AND YO
ATTORNEYS AT LAW
102 NORTH FIFTH AVENUE
P. O. BOX 606
WILMINGTON, N. C. 28401

July 3, 1968

JUL 5 1968
SECTION

Mr. Lloyd W. Gebhard
Regional Director
Federal Water Pollution Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Gebhard:

This will thank you for your letter of June 21st, 1968, relative to pollution problems in the Nation's estuarine areas.

I am very much interested in the estuarine areas, and regret that I will not be able to attend the meeting in New Bern; however, I am taking the liberty of offering the following suggestions for your consideration:

1. The fresh water should be impounded so as not to allow the salt water to penetrate the upper marshlands where mosquitoes breed. This can be done by spillways.

2. The fresh water supply, both underground and otherwise, should be protected; that is, wells of any appreciable depth should be drilled only by permit.

3. Pollution, of course, should be held to a minimum. I think the impoundment above mentioned would add considerably to sports and recreation as well as the fresh water supply and reduce pollution which, of course, should be controlled at its source.

4. Persons owning properties bordering on salt water areas, marshes, etc., should be advised as to the best method of protecting fish and wildlife and at the same time reducing the salt water marsh mosquito, and such work as suggested by this department should be done without the owners being subject to civil suits by persons claiming damage

to oyster bottoms. It is my opinion that the present method of leasing oyster gardens is outmoded, unfair to property owners, not properly policed and 90 per cent are nonproductive and being held only for the purpose of collecting damage out of the Federal Government or private property owners who wish to ditch their marshlands or improve channels, thus delaying progress.

Thank you for this opportunity of expressing my opinion.

Yours sincerely,

EDGAR L. YOW

ELY:l

cc: Mr. George E. Pickett
Director
North Carolina Department of
Water & Air Resources
Raleigh, North Carolina 27601

The Blue Channel Corp.

Port Royal, South Carolina 29935
Telephone: 803-524-3153

RECEIVED
JUN 27 1968
SERVICES
SECTION
FWPCA

June 26, 1968

Mr. Lloyd W. Gebhard, Regional Director
Middle Atlantic Region
918 Emmett Street
Charlottsville, Virginia 22901

Dear Mr. Gebhard:

Your invitation to attend the public meeting in New Bern relative to the pollution of the North Carolina estuarine areas. has been forwarded to my attention and I regret that I shall be unable to be present because of previous commitments, but I would like to submit the following for the record.

"Pollution encroachment of our estuarine water seems to be never ending; therefore, it we are to continue to expect these areas to continue to be a source of our food supply, to be made available for sport activities as well as to be acceptable for recreational purposes, then we must act now with the necessary laws to prevent further such encroachment. We are still in a position where any decision made to abate pollution can be made without materially affecting the economical growth of our area. I further feel that our particular estuarine waters of North Carolina are more vulnerable to the problems of pollution because of the lack of large water movement due to minimal tidal changes."

We, in the industry, are concerned with the diminishing supply of seafoods in North Carolina and hope that you too will be concerned and help us save the industry.

Respectfully submitted by:

S. E. Waskiewicz
Vice President
The Blue Channel Corporation

SEW/br
CC: Mr. George E. Pickett (111)
Mr. Milton E. Gunn

JOHNSON & DAVIS
ATTORNEYS AT LAW
31 CORBAN AVENUE, S. W.
CONCORD, NORTH CAROLINA 28025

JAMES C. DAVIS
JAMES C. JOHNSON, JR.

TELEPHONES
782-8313
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AREA CODE 704

JUN 27 1968

June 26, 1968

Mr. Lloyd W. Gebhard
Regional Director
Middle Atlantic Region
U. S. Department of Interior
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Gebhard:

I deeply appreciate your letter of June 21, 1968 wherein you extended to me an invitation to meet on July 26, 1968 at the New Bern Courthouse for the purposes of taking information regarding water pollution in North Carolina.

Due to my heavy court schedule and other commitments, I am unable to come, but I am writing you this letter in order that you might know my key interest in your program and the fact that I am deeply concerned about the problem of water pollution in the United States and more particularly in North Carolina.

Much has been said and done in various sections of the country about water pollution, and I know that we hear a great deal today about the federal government's stepping in and regulating areas formerly under State control, but in some cases such as water and air pollution, I think it is absolutely necessary even though the State of North Carolina has certain laws regarding water and air pollution. In addition thereto several of our State agencies who are directly interested in this particular field have done a good job in trying to keep our streams clean, nevertheless we have not performed in North Carolina to the fullest degree of our ability. As in all States there are extremely strong business interests such as textiles and tobacco that dump their byproducts into the various streams within our State, and though much has been said about it and many complaints registered, very little has been done to see to it that these corporations, who could well afford purification equipment, install such equipment and process the water before it is placed back into our streams.

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Here in Cabarrus County there are several streams which are so polluted with chemicals from the various cotton industries that a person has to roll up their automobile windows as they travel along U. S. Highway #29 or else they become sick at the strong odor that is emitted from some of our streams.

Here again powerful business interests have seen to it through the years that no real action is taken to clean up these streams and force the companies to return the water to the streams as they found it.

As a member of the General Assembly of North Carolina I wish to voice my support of the Clean Water Restoration Act of 1966, and encourage the Congress of the United States to take any and all measures it deems necessary to require industry in this nation to be more careful with what I consider our most precious natural resource.

I appreciate your kind invitation, and I hope my thoughts will add some support to your cause.

Sincerely yours,

James C. Johnson Jr.

James C. Johnson, Jr.

JCJjr:jle

(113)

SPEECH OF BENNIE KETNER-REPRESENTING CRAVEN COUNTY, HAVELOCK, N. C.

Mr. Chairman, Officers of the board, fellow citizens, we have heard some wonderful speeches on generalities and methods of controlling sanitation and pollution of our streams. It does my heart good to hear the concern that has been displayed. I think these speeches have covered every aspect of the situation, therefore, I cannot add anything new on generalities.

What I would like to bring up is a specific case; Slocum Creek, which is a tributary of the Neuse River, about 18 miles down from New Bern. It borders Cherry Point.

In 1919, my father moved his family to Havelock. He bought 300 acres of land bordering Slocum Creek. Cherry Point now borders the other side. At that time there were many fishing camps, to the best of my knowledge there were 15 fishing camps, Slocum Creek was know to be one of the best fishing grounds of all North Carolina.

There was a very large fish kill from pollution about seven years ago, then another four years later. An investigation was made in each case by the game warden and his findings is undoubtly on record.

Seven years ago I started writing letters, one to Congressman Graham Barden, several to the Corps of Engineers and one to Bureau Yards and Docks. I was endeavoring to get Slocum Creek cleaned out and to stop the pollution.

One gentleman in the hall spoke of sedimentation. He stated that this was no problem in the rest of the State. I wish to say that there is a problem; there is from six to twelve feet of sediment in places, part of it being due to construction at Cherry Point. At one point near the power plant it reaches nearly 3/4 of the way across the creek. Cedar creek has been completly filled up from construction of Caphart Housing, the fresh dirt ran down in the creek and pushed the mud up. Once tug boats entered and went up the creek for 1/2 mile, now, a row boat cannot enter. Logs and other silt have about stopped up the creek near east fork and west fork entrance.

The bridge going from Cherry Point to Caphart Housing area was built without consideration of our reparation rights. Accourding to the Bureau of Yards and Docks, once a stream is navigable it is to so remain. No one owns the channel but has a right to use same. The bridge in question does not have a span wide enough for small boats to go and come comfortably.

At the entrance to Slocum Creek is a sunken barge that has been there for a number of years. The channel to the river is closed in.

Pollution has been a major problem for years. Oil has been dumped in the creek from the Havelock-Cherry Point area. Fish caught in the creek are not edible.

In conclusion, I believe now is the time that action should be taken in this Matter. I thank you.

(115)

Bob Simpson

OUTDOOR WRITER - PHOTOGRAPHER
YACHT "SILVER SPRAY"
MOREHEAD CITY, N. C. 28557
PHONE 726-5403

July 26, 1968

Federal Water Pollution
Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Va.

Gentlemen:

We are talking about wise use of our estuaries, preservation of certain areas and optimum use of others, without adverse effect on surrounding land and water. We are talking of sharing our resources.

Some of the major sources of danger are pollution of upstate streams, by industry particularly: manufacturing by-products, acids and other chemicals, heavy metals and oxygen-reducing materials. Also of growing concern is the matter of thermal pollution.

Another great danger is from new industries, as mining, which uses vast acreage in land fill or removal, plus the possible alteration of the chemistry of the estuarine environment. Further, a great unknown effect comes from herbicides, pesticides and fertilizers entering the watersheds.

The clear and present danger is land alteration, which endangers the estuaries through real estate and industrial development, navigation, drainage, highway construction, mosquito control and flood control.

Strict controls must be enforced. Zoning is the first step. In present society a permit is necessary to alter or construct a home. This permit system can well be extended to real estate and industrial development, particularly as it affects any watershed or estuarine area.

Because it is necessary to provide homes, build roads, dig ditches and otherwise alter land, a system of reclaiming altered land should be developed. Spoil banks could be constructed in such a way as to enhance marine growth. Research on planting of beneficial grasses and cover plants should be encouraged. Channel design could perhaps be improved, siltation and erosion controlled.

The horrible example of altering rivers under the guise of flood control is classic. The usual method is to run a dragline upstream with no regard for natural features. The same benefits

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could often be obtained by simply removing logs and obstructions without the digging operations. Every alteration permit must include rehabilitation features.

Non-industrial uses of the estuaries need to be given more consideration. Hunting, fishing and recreational uses of the estuaries are now major sources of income to coastal areas. Commercial and sports fishing mean about $100 million annually to North Carolina; hunting and boating figures would boost this figure by another substantial amount. Goose hunting alone amounts to more than one-half million dollars. More than 3,000 non-resident yachts cruise in North Carolina waters every year.

Land acquisition is of utmost importance. Key areas most valuable to the estuarine program must be obtained by the state, with federal assistance where required, to be zoned with reversionary clauses guaranteeing their continued proper use.

We must encourage waste control programs, making no exceptions for any industry or municipality. Further research on pesticides, herbicides and fertilizers is urgently needed. Along with these activities, higher water standards for the major watersheds must be invoked.

We are faced with a last-ditch stand in behalf of our estuarine resources. It is a vanishing frontier that we cannot afford to despoil further.

Respectfully,

Bob Simpson

Bob Simpson

(117)

TEXAS GULF SULPHUR COMPANY
PHOSPHATE DIVISION
AURORA, NORTH CAROLINA

GUY T. McBRIDE, JR.
VICE PRESIDENT AND GENERAL MANAGER

8 19
OFFICE SERVICES
SECTION
FWPCA
4 3 2

August 5, 1968

Honorable Eugene T. Jensen
Regional Director
Middle Atlantic Region
Federal Water Pollution Control Administration
United States Department of the Interior
918 Emmet Street
Charlottesville, Virginia 22901

Honorable George E. Pickett
Director
North Carolina Department of Water and Air Resources
Raleigh, North Carolina

Re: FWPCA Public Hearing; July 26, 1968;
New Bern, North Carolina

Gentlemen:

I herewith forward to you for filing, as part of the record of the above hearing, my written statement.

Thank you for inviting me to file a statement for the record.

Yours sincerely,

Guy T. McBride, Jr.
(By jem)

GTMcB:jem

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August 5, 1968

STATEMENT FOR THE RECORD OF A PUBLIC HEARING HELD IN NEW BERN ON JULY 26, 1968, BY THE FEDERAL WATER POLLUTION CONTROL ADMINISTRATION.

TO: Honorable Eugene T. Jensen, Regional Director, Middle Atlantic Region, Federal Water Pollution Control Administration, United States Department of the Interior, and Honorable George E. Pickett, Director, North Carolina Department of Water and Air Resources, Raleigh, North Carolina:

Gentlemen:

My name is Guy T. McBride, Jr. and I am Vice President - Phosphate Division, Texas Gulf Sulphur Company and the corporate officer in charge of the phosphate mining and phosphate fertilizer materials manufacturing operations of that division located near Aurora, North Carolina. I reside in Washington, North Carolina. Thank you for the invitation and opportunity to file a statement in connection with your study of estuarine resources pursuant to Section 5(g) of the Federal Water Pollution Control Act, as amended by the Clean Water Restoration Act of 1966.

Texas Gulf Sulphur Company is interested in all of the estuarine resources of North Carolina, but it has a particular interest in the Pamlico estuary. Consisting of over one million acres, the Pamlico Sound is the largest estuarine area in North Carolina. It is a highly valuable resource of the State and suited to many uses. Its potential for navigation can play a large part in the development of the phosphate

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industry in North Carolina. The possibility of a deep-water channel from the Atlantic Ocean across the Pamlico Sound to the phosphate mining area in Beaufort County was one of the principal incentives for the large capital investment made in Beaufort County by Texas Gulf Sulphur Company. Shipment by water is by far the most economical method of transporting a bulk commodity, and the economical transportation of products is as important to our industry as is exploration and mining.

Before beginning its mining activities, Texas Gulf began a study of the Pamlico River and the Pamlico Sound, their potential for development, and the possibility of ecological changes which might result from the Company's phosphate mining and manufacturing activities. It was then and is now our firm intention to fully develop the potential of the natural resources in the area without adversely affecting the environment. To this end, the Company has contributed to studies by North Carolina State University at Raleigh of possible hazards to the ecology of the region from the Company's planned activities. The Company has also established a water and air pollution monitoring, research and abatement program and is working in close cooperation with federal, state, and local agencies to assure the best possible protection of all of the natural resources of the area.

The Department of Water and Air Resources is the state agency responsible for water and air pollution abatement and control in North Carolina. From our experiences with this state agency, I can state that it has done a good job of controlling waste discharge in the area where we are located and, in my opinion, it appears to be the appropriate governmental agency to continue to perform that task in the estuarine areas of the State of North Carolina. It should receive all of the financial assistance, research, and technical help which the greater resources of the federal government can provide, when the federal government is called upon by the State of North Carolina for assistance.

All of the uses of estuaries mentioned in Section 5(g) of the Federal Water Pollution Control Act are being made or are contemplated for the Pamlico estuary. To my knowledge, none of these uses are in conflict in any way at present and any conflicting uses which might arise can best be resolved by the state agencies presently responsible for managing estuarine areas in North Carolina.

While there may be some sentiment for the development of a comprehensive national program to manage estuarine resources, it would be very difficult and perhaps impossible to recommend a national program which could properly take into consideration the peculiar nature and particular uses being made of each of the many estuarine areas in the United States; While it is arguable that an estuarine area such as the great Pamlico estuary is a national resource, it is indisputably the most valuable natural resource of the state and local area in which it is located. It must, therefore, be developed in such a manner as will best meet the needs of the people in that area. Planning and management programs to accomplish this purpose can be adopted and administered best by state and local governments working together with the people of the area.

It is important that the value of estuarine resources be discussed, that the national dialogue about the management and development of these resources continue, that the United States Congress be advertent to the continuing needs for planning and management of these resources and that the estuarine resources be developed in the best interest of all concerned. Each estuarine program should be suited to the specific needs of the estuarine zone involved. If any program is proposed for North Carolina estuarine areas, and particularly the Pamlico estuary, Texas Gulf Sulphur Company would wish to be invited again to express its views.

Thank you for the opportunity to file this statement.

(122)

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

DEPARTMENT OF BOTANY AND PLANT PATHOLOGY · NATURAL SCIENCE BUILDING

June 28,1968

Mr. Lloyd W. Gebhard and
Mr. George E. Pickett
United States Department of Interior
Federal Water Pollution Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Gebhard and Mr. Pickett:

Thank you for the invitation to the Ecological Society of America to present a statement at the hearing on estuaries July 26,1968 at New Bern, N.C.. As the current president of the Society, I have asked Dr. H.T. Odum of the University of North Carolina to represent this Society and make a detailed presentation at the hearings. There has not yet been time to receive an acknowledgement from him, but I hope that his very busy schedule will permit him to participate in this important meeting.

The Ecological Society's Public Affairs Committee currently is between chairmen, but I feel certain they would recommend against any development schemes that would seriously reduce the area of estuary habitat in North Carolina. There seems little doubt but that the long term, biological worth of these valuable resources will far outweigh any short-term development by fill or through sediment exploitation. I am sure they would also endorse biologically sound steps to reduce pollution deterioration to the estuaries.

My personal view is that the Department of Interior should begin a thorough study of the biological and nutritional contribution of the estuaries to the continental shelf waters as well as of their value as waterfowl producing areas. When one notes that the total national acreage of the estuarine ecosystem type is very small, some expanded consideration of its intrinsic interest valve is also warranted.

The increasing pollution loads in the streams as well as the increasing probability of additional oil tanker founderings all tend to endanger this ecosystem type. In my estimation the estuaries warrant far more careful study and far less stress from man.

Thank you for the opportunity to contribute to your public hearings.

Sincerely yours,

J E Cantlon

J. E. Cantlon, President
Ecological Society of America

JEC:hv

(123)

STATE OF NORTH CAROLINA
DEPARTMENT OF WATER AND AIR RESOURCES

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P. O. BOX 9392
RALEIGH, N. C. 27603
TELEPHONE 829-3003

JUL 31 196
OFFICE SERVICE
SECTION
FWPCA

July 29, 1968

Mr. Eugene T. Jensen, Regional Director
Federal Water Pollution Control Association
U. S. Department of the Interior
918 Emmet Street
Charlottesville, Virginia 22901

Dear Mr. Jensen:

In accordance with your wishes, the submission of the State of North Carolina in connection with the July 26th hearing on estuarine area management was made for the record only. It included the report of our Estuarine Study Committee, which was approved by the Inter-Agency Council on Natural Resources. I wish to submit a further statement for the record, to emphasize a feature of the report.

In the report you will find mention of the possibility of creating new marsh or habitat or up-grading that which exists. One possibility is that of levelling dredge-spoil banks at an elevation within the tidal range, and planting desirable marsh grasses on them. We are doing a small experiment on this at present. It might have considerable application on the spoil banks along the Atlantic Intracoastal Waterway. Another possibility is that of planting more desirable species of marsh grasses. A scientist at North Carolina State University advises that black rush is not a productive plant as far as fish are concerned, though it has benefits for other forms of estuarine life. You will recall that we saw extensive areas of black rush on our flight over the estuarine areas on July 25th. It would appear possible to replace some of this to provide more balanced estuarine habitat. In addition, our Wildlife Resources Commission has successfully constructed shallow impoundments in the estuarine areas which have increased benefits to wildlife.

The point is that the program for management of the estuarine areas should not be entirely one of regulation, by zoning and pollution control, to which almost all of the comments in the public hearing were addressed. It should also have imaginative, constructive, and creative features.

Sincerely,

George E Pickett

George E. Pickett

(124)

JACOB KOOMEN, M.D., M.P.H.
STATE HEALTH DIRECTOR
AND SECRETARY-TREASURER
W. BURNS JONES, JR., M.D., M.P.H.
ASSISTANT STATE HEALTH DIRECTOR

NORTH CAROLINA
STATE BOARD OF HEALTH
P. O. BOX 2091
RALEIGH, NORTH CAROLINA 27602

July 25, 1968

Position Statement Relating to Pollution of Estuarine Areas By Sewage and Industrial Wastes In North Carolina

Submitted By

Marshall Staton
Assistant Director
Sanitary Engineering Division
North Carolina State Board of Health

Pollution of North Carolina estuarine areas by sewage and industrial wastes is of interest and concern to the Sanitary Engineering Division of the North Carolina State Board of Health, both in principal and in relation to the Division's activities and responsibilities.

SHELLFISH SANITATION ACTIVITIES

Since the 1920's, the State Board of Health has been engaged in a shellfish sanitation program in close cooperation with the North Carolina Department of Conservation and Development, the United States Public Health Service, and the United States Food and Drug Administration. An integral and essential part of this program is the surveillance of shellfish growing waters; including:

(1) Sampling and bacteriological analysis of shellfish growing waters.

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PAUL F. MANESS, M.D., BURLINGTON
ERNEST A. RANDLEMAN, JR., B.S.PH., MOUNT A
HOWARD PAUL STEIGER, M.D., CHARLOTTE

(2) Establishing the boundaries of polluted areas, which are closed to shellfish harvesting by action of the Board of Conservation and Development.

(3) Policing the closed areas to prevent illegal harvesting, done by the Division of Commercial and Sports Fisheries of Conservation and Development.

(4) Surveying the shorelines to locate and correct insanitary sewage disposal systems.

At present, approximately 1,400,000 acres of actual and potential shellfish growing waters are under surveillance. During the 1966-67 fiscal year 5120 water samples were examined. As of January 1, 1968, approximately 45,000 acres, in 21 locations, were closed to shellfish harvesting.

In the future, it may be necessary to extend the closed areas, or it may be possible to reduce them, depending upon progress in reducing pollution by municipal, industrial, private and Federal sources - including shore installations and boats. The Sanitary Engineering Division, in close cooperation with the county health departments, is actively engaged in shoreline survey work to locate and correct sources of pollution other than municipal, industrial, and Federal. There is close cooperation with the North Carolina Department of Water and Air Resources. It is hoped that Federal plans to minimize pollution by its installations will not be abandoned.

With regard to pollution by boats, Chapter 75A of the General Statutes of North Carolina provides that boats with toilets shall have approved treatment devices or holding tanks; however, the law applies only to boats operating on inland fishing waters and inland lake waters.

We understand that proper disposal of wastes from watercraft is provided for in bills now being considered by Congress - S 2525 and HR 13923 - and we endorse the principal of this proposed legislation.

OTHER ACTIVITIES

Other activities of the Sanitary Engineering Division are less directly related to estuarine pollution problems. Salt-marsh mosquito control activities involve (1) ditching to speed up the outflow of high tide waters from the marshes or (2) the construction of impoundments; these activities would have little if any adverse effect on estuarine pollution.

The Sanitary Engineering Division is actively engaged in studies and advisory assistance to municipalities and counties regarding solid wastes. Disposal by dumping in estuarine waters is not recommended.

DISCUSSION

The Sanitary Engineering Division would be pleased to make available to the Department of Interior its data on sampling of shellfish growing waters - actual and potential. Also, we would cooperate with and assist that Department, insofar as our time and resources allow, if desired.

RECOMMENDATION RELATING TO MANAGEMENT

It is believed that the effective application of existing statutes with continued cooperation between the agencies, groups and interests involved, supplemented by legal authority to control pollution from vessels in estuarine waters, will enable proper management of the estuarine resources, insofar as our direct responsibilities are concerned.

EDENTON CHAMBER OF COMMERCE
INCORPORATED
EDENTON, NORTH CAROLINA
TELEPHONE 482-3400

ROBERT W. MOORE
EXECUTIVE VICE PRESIDENT

116 EAST KING STREET

AUG 2 1968
FWPCA

July 24, 1968

Mr. Lloyd W. Gebhard, Regional Director
Middle Atlantic Region
Federal Water Pollution Control Administration
U. S. Department of The Interior
Charlottesville, Virginia 22901

Dear Mr. Gebhard:

I was delighted to learn that the Department of the Interior will make a comprehensive study of pollution problems concerning our estuarine areas.

Mr. George E. Pickett, Director, North Carolina Department of Water and Air Resources is the best and it is our pleasure and privilege to assist him in any way.

Those of us who are located on estuaries are vitally aware of the increasing pollution of our streams from our Cities, Towns, Industries, and Insecticides used by our farmers upstream. The Chowan River was one of nine areas that experienced Fish Kills last year.

I personally feel that with Federal coordination with all the 50 states in regards to pollution this would solve a large portion of our problem. If we can prevent pollution before it occurs rather than wait to curb it after it has made our water objectionable for use would be a tremendous advancement.

Thank you for allowing us to make this statement. It shall be our pleasure and privilege to assist in any way possible in bringing this to a completion.

Sincerely yours,

Robert W. Moore

Robert W. Moore
Executive Vice President

(128)

RWM:jo

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NEW BERN, N. C. 28560

D. L. WARD, SR. (1860-1932)

D. L. WARD
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J. TROY SMITH, JR.

310 BROAD STREET
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AUG 5, 196
OFFICE
SECTION
FWPCA

August 1, 1968

United States Department of the Interior
Federal Water Pollution Control Administration
Middle Atlantic Region
918 Emmet Street
Charlottesville, Virginia 22901

Re: North Carolina public meeting pertaining to the National Estuarine Pollution Study in New Bern on July 26, 1968.

Gentlemen:

Thank you for your letter of July 29, 1968, allowing me to furnish a statement in connection with the above-entitled matter.

New Bern, North Carolina, and the area bordering on the Neuse River from New Bern to the Pamlico Sound is subjected to severe hurricanes whick have occurred periodically since this area was first settled. They not only cause great flood damage, but also cause estuarine pollution.

The Federal government in 1946 after considerable study, recognized the great damage these hurricanes did not only to the privately owned property, but to the United States Marine Air Base at Cherry Point, and upon their recommendation, Congress, in 1965, authorized the construction of a hurricane-dike barrier across Neuse River approximately eighteen miles below New Bern to protect the City and its environs against tidal floods caused by hurricane winds. United States Senator B. Everett Jordan, United States Senator Sam Ervin and District United States Congressman Walter Jones have appeared before the Appropriations Committees of Congress with the following statement:

"Three years ago the Congress authorized construction of a hurricane-dike barrier across the Neuse River estuary near New Bern to protect the city and its vicinity from tidal floods which are periodically caused there by hurricane winds. Each year since then I have requested the necessary funds to initiate a model study of the project and the District Engineer advises me that he could effectively use $100,000 for this purpose during fiscal 1969. The study would enable him to determine the effectiveness of any proposed barrier as well as whether construction of it would have any adverse effects on the Pamlico County area downstream from it.

The Engineers estimate that a hurricane similar to the ones which occurred in 1954 and 1955 would cause damages of $12,036,000 based on 1963 price levels and that such damages figured on an annual basis over a 50 year period would average $621,000 per year. They estimate that the proposed barrier would reduce average annual flood damage by about 98 percent.

The total estimated cost of this project would be $14,900,000 with $10,400,000 provided by the federal government and the remainder by state and local interests.

I hope very much your Subcommittee will approve my request for $100,000 so that the model study may be commenced during fiscal 1969."

To date, Congress has not appropriated any funds to continue this work but it is expected that when they realize the great damage these hurricanes do, especially in erosion and the filling of the estuary waters and damage they do to the Marine Air Base, that some action will soon be taken.

Locally we feel that if this project can be carried on that it will be an initial step in this country in the elimination of such erosion.

If the barrier could be built it would furnish a great recreation area for the Marine Station in Cherry Point and the citizens of this area. Attached hereto is a copy of a letter dated May 18,1965 from the Department of Water Resources, State of North Carolina, addressed to Honorable Dan K. Moore, Governor of North Carolina.

It is hoped that your Committee will give consideration to this most important phase of the good work you are doing.

Yours very truly,

D. L. Ward

DLW:ms

enclosures

STATE OF NORTH CAROLINA

DEPARTMENT OF WATER RESOURCES

[illegible] CHAIRMAN

[illegible]
GLENN M. TUCKER

WALTER E. [illegible] DIRECTOR
P. O. BOX [illegible]
RALEIGH, N. C. [illegible]
TELEPHONE [illegible]

May 18, 1965

Reproduced from best available copy.

Honorable Dan K. Moore
Governor of North Carolina
Raleigh, North Carolina

Dear Governor Moore:

The Bureau of Budget has approved the Hurricane Tide Barrier Project across the Neuse River below New Bern and has forwarded it to the Public Works Committees of the Senate and House of Representatives. This action of the Bureau of Budget will permit the inclusion of this project in the Rivers and Harbors Act commonly referred to as the Public Works Omnibus Bill for congressional authorization. All funds for civil works projects are included in the Public Works Appropriation Act.

New Bern and Vicinity has been flooded by 12 hurricane tides during the period 1802 to 1962 and has been threatened by many other hurricanes. The hurricane damage in 1954 and 1955 amounted to over $10,000,000 and the waterfront business district was flooded with 4 to 8 feet of brackish water contaminated by sewage. Residential areas were also flooded. ✓

The New Bern and Vicinity, North Carolina Hurricane Study was prepared by the U. S. Army Engineer District, Wilmington, under the provisions of Hurricane Study Report P. L. 71, 84th Congress, June 15, 1955, to determine the most practicable plan for providing protection from hurricane tides, its cost and economic justification, and the amount and type of local cooperation required.

It includes the provisions for a model study to determine the effectiveness of the proposed hurricane barrier in reducing the flood damage to New Bern and Vicinity as well as any effect it might have on hurricane tidal flooding of the area downstream from this barrier. This model study will also provide data for resolving reservations on this project by the U. S. Department of Health, Education and Welfare as well as by the Fish and Wildlife Service. The information obtained from this model study will be the bases for a final design that will alleviate these reservations.

A summary of the work included in the project and the justification is as follows: Tidal waves induced by hurricane winds are driven up the Neuse River which cause flooding in the business area as well as in the residential area of New Bern to a depth of 4 to 8 feet. This project would provide protection against the maximum tidal flood of record which was caused by Hurricane Ione on September 19, 1955. The barrier would be constructed across the Neuse River 18 miles downstream from New Bern which is the narrowest point in the river. The barrier would be 10,400 feet long with the top 50 feet wide at an elevation of 16 feet above mean sea level. A navigation opening 440 feet wide at mean sea level would be provided. The downstream face of the barrier would have a 1 on 30 slope which would provide an excellent bathing beach as well as a recreational area for all aquatic sports, as well as for fishing piers and small boat marinas. The top of the barrier is suitable for use for the construction of a highway to cross the Neuse River at this point with a bridge across the navigation opening.

In addition to the elimination of hurricane tidal flooding, this hurricane barrier will provide a sense of security against the possibility of hurricane flood damage and thereby eliminate the "scare cost" incurred from threats of hurricanes. It will also be an inducement for industrial development of this area due to the elimination of floods and threats of floods. This barrier will also eliminate the pollution of the water supply as well as reduce salinity intrusion of the water supply and also reduce the salt water-marsh mosquito breeding areas.

The annual economic benefits for the project are $675,900 with a benefit cost ratio of 1.1. The Federal share of the construction cost is $10,440,000 and the non-Federal share is $4,460,000.

Governor Sanford as well as the Department of Water Resources and Craven County have expressed their intention of being capable of meeting the requirements of local cooperation to include the non-Federal share of the cost. At the time these expressions of intent were made, it was anticipated that the General Assembly of North Carolina would appropriate funds to permit the State to pay 80% of the non-Federal cost.

This information is submitted so that you may be fully acquainted with the history of this project and current developments. We appreciate your interest and support of our program.

Sincerely,

Walter E. Fuller

cc: Mr. Ed Rankin
Honorable Sam L. Whitehurst
Honorable H. C. Godwin
Honorable Leland V. Brinson

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A STATEMENT OF RECOMMENDATIONS FOR PROTECTION OF ESTUARINE RESOURCES IN NORTH CAROLINA

Submitted By

Donald B. Horton
Director, Pamlico Marine Laboratory
North Carolina State University

Open Hearing, County Courthouse
New Bern, N.C.
July 26, 1968

It is generally conceded that we need more information on which to base our water quality standards and to protect estuarine resources. Unfortunately, many of the problems associated with pollution in estuaries demand an interdisciplinary approach usually over an extended period of time and involving many complex variables. Although state, federal and private organizations must all be involved in estuarine research, long range programs in environmental ecology can best be handled by university administered research which is not subject to many of the pressures and budget uncertainties of officialdom or to the self interests of private organizations.

This kind of research takes a long time, but time is short if we are to prevent destruction of our estuaries. Therefore I believe that water quality standards must be applied and strictly enforced right now.

It is clear that water quality standards are not the whole answer to the prevention of pollution in estuaries. Subtle relationships exist between estuarine organisms and their environment and these cannot be upset without the chance of catastrophic alterations to the ecosystem. Water quality standards will not necessarily insure that a threshold limit will not be reached beyond which the estuary may be irrevocably altered. Even if the standards are relatively conservative, multiple use of large volumes of estuarine water by diverse industries can substantially increase the risk of harm while each industry and municipality maintains a good rating in its effluent discharge. Sometimes an industry claims that their waste treatment facilities will remove some 95 to 99 percent of the harmful waste products. These figures are without meaning however, unless we also know (1) the total volume of the released effluent; (2) the volume exchange characteristics of that portion of the estuary which receives the wastes; (3) possible synergistic effects between the effluent and other industrial and domestic effluents released to the estuary.

It is true on the other hand that any natural environment has some capacity to absorb pollutional insult. The public interest is not best served by imposing unnecessarily restrictive water quality standards on industry. Standards should be consistent with the characteristics of the effluent and with the ecology and hydrology of that portion of the estuary receiving the wastes.

I suggest that legislative machinery be put into operation to protect and optimize our estuarine resources and to provide the necessary information on which water quality standards can be continually updated and improved. North Carolina has a series of unique estuarine environments which, unfortunately, from the standpoint of pollution control are largely interconnected. Substantial harm to one of the estuaries emptying into the Pamlico Sound could jeopardize the entire estuarine system. North Carolina must take bold steps in the very near future to protect this unique environment. I suggest the following plan which would substantially increase the funds available for comprehensive estuarine research on a regional basis.

Before a permit be granted for land aquisition or plant construction, a report be submitted by the industry to an independent estuarine resources panel made up of competent professionals. This report should specify a plan for water use, including an estimate of concentrations of all contaminants in the effluent water and the anticipated volume discharge. This information should be released to all public agencies. Interested research agencies would be invited to submit proposals to study the anticipated impact of this plan of water discharge on the estuarine environment. This plan should not replace the responsibilities of the North Carolina Board of Air and Water Resources but rather should supplement their efforts to protect the estuaries of North Carolina. Neither should this legislation prevent industry from going ahead with construction and operations providing they meet the current acceptable state water quality standards. This plan is intended only to provide badly needed information on which to base future recommendations.

Proposals would be evaluated for merit, previous performance of the investigative staff, and appropriateness of the research plan. A cost formula based on the seriousness of the disposal problem, the volume and concentration of the wastes and the size of the industry must be worked out. Presumably, industry would bear the cost of this research. Ecological considerations should be stressed, and the study should include some of the following:

(1) Ecology of the discharge site and operational procedures for treatment storage and release of wastes.

(2) Laboratory studies on selected, commercially important species or indicator species including the major biotic trophic levels.

(3) Pilot scale experiments with natural communities in replicated environmental systems.

(4) Monitoring of the estuary before, during and after the plant is operational.

(5) Evaluation of the waste material and alternative suggestions for

treatment, recovery of byproducts or utilization of the waste in potential aquicultural practices.

It is understood that this plan would allow independent university research organizations to participate in the evaluation of estuarine resources before substantial damage or alteration has been done to the environment. This plan is admittedly directed toward large industries and other agencies which use substantial quantities of water or which plan to alter significant portions of natural environments by dredging or land fill operations.

Although existing state agencies do have real expertise and responsibilities to the public welfare, they do not have all the technical and human resources that are available in the university community. I do not advocate that water quality standards be relaxed as the price to pay for adoption of a plan similar to that proposed. However, I do suggest that the findings of intensive estuarine research that would result from a successful plan, would generate the information needed for ecologically meaningful standards for waste disposal for each section of the estuary, and for each industry.

STATEMENT OF THE RESOURCES DEVELOPMENT COMMISSION FOR BRUNSWICK COUNTY
TO
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

The Resources Development Commission for Brunswick County was created under a Special Act of the North Carolina Legislature in 1963 and charged with the responsibility of the Economic Development of Brunswick County, North Carolina.

The primary responsibility and interest of the Resources Development Commission for Brunswick County is in the promotion of Recreational and Tourist development, Commercial and Sports fishing, and Industrial Promotion.

Clean and useable water is of primary interest in all of these activities, and it is for this reason that the Resources Development Commission for Brunswick County submits this statement.

The North Carolina Stream Sanitation Commission, which is now the Water and Air Resources Board has taken the initiative in North Carolina to classify and control the Streams and Estuarine areas of our State. Important progress has been made in the elimination of pollution in all of the Streams, Rivers and Estuarine areas since this organization was established, and has been in operation. The leaders of our State and the North Carolina Legislature have realized the importance of the control of our waterways and have provided funds for the study and control.

In the development of Recreational and Tourist industry of North Carolina, clear and wholesome water is a must if we are to continue our growth. The annual income in Brunswick County from Tourist is now approximately 5 million dollars according to a study by Dr. Lewis C. Copeland of the University of Tennessee.

Commercial and Sports fishing is also of utmost importance to the potential growth of Brunswick County. The estuarine areas are important as a breeding ground for the various species of fish and marine life that provide both recreation and livelyhood for many of the Citizens of Brunswick County. Much has been accomplished under the leadership of Dr. David A. Adams, Director of the Commercial and Sports Fishing Division of the North Carolina Department of Conservation and Development. These activities consisting of research, promotion and enforcement have increased the yield of Seafood in Eastern North Carolina.

At times industrial growth has been synonymous with water pollution. This is not entirely true in that many firms who require water for either processing, cooling or domestic purposes have provided adequate treatment facilities before returning the water to the various Streams and Estuarine waters. Under present law all industrial users must submit and receive approval of their plans for waste disposal from the Water and Air Resources Board of North Carolina before dumping industrial waste into streams.

Many of our Cities and Towns have now, or are in the process of, providing adequate treatment facilities before dumping their waste into our streams, rivers, and estuarine areas. We believe within a reasonable period that all of the municipalities in our State will have adequate treatment facilities. It is also hoped that the financing of Public Waste Treatment Facilities can be expedited by more participation by local, State and Federal Agencies in providing funds to complete these facilities which will reduce pollution in our Streams, Rivers and Estuarine areas.

It is our belief that cooperation between the Federal Water Pollution Control Administration, the North Carolina Water and Air Resources Board, and other State agencies can accomplish the total mission by combining their efforts in the study of water pollution.

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We urgently request that control of the Rivers, Streams, and Estuarine areas remain under the control of the State departments where the State has an adequate program, and indicates an interest in providing the leadership that is required to eliminate pollution in our waterways.

By the control being vested in a State agency, the best interest of the Citizens of the State can be served. A State agency is more capable of being familar with local problems and can act to serve the best interest of all concerned. It is more convenient for local officials to meet with representatives of a State agency to discuss problem areas and arrive at a satisfactory decision.

A blanket non-degradation policy would definately not be in the best interest of each of the States. A policy of this type could hamper the growth of the area, and be a major deteriant to industrial possibilities in Eastern North Carolina. Mr. Edward E. Utley, Manager, Power Production, Carolina Power & Light Company covered this subject superbly in his statement at the public hearing in New Bern, North Carolina on July 26, 1968. A blanket non-degradation policy could have seriously hampered this major project which is urgently needed in Brunswick County, North Carolina. Mr. Utley and the officials of Carolina Power & Light Company have amply shown that their company is willing to cooperate with the Water and Air Resources Board in meeting the criteria established for this type of operation.

In most cases, we have found that Industry is very cooperative in providing adequate treatment facilities for their waste, and that a satisfactory arrangement for waste disposal can be worked out with the Water and Air Resources Board. This State agency works continously to insure the proper treatment of waste, and the elimination of pollution of our Streams, Rivers, and Estuarine areas.

The North Carolina Water and Air Resources Board is doing an excellent job in our State, and we feel that they are capable and anxious to continue their control of our Streams, Rivers and Estuarine areas.

REAR ADMIRAL J. W. DAVIS, USN (RET.)
MILLPOINT, OLD NASSAU ROAD
WILLISTON, NORTH CAROLINA 28589

12 August 1968

Mr. J. Cary Gardner, Director
Technical Programs
U. S. Department of Interior
Middle Atlantic Region
Charlottesville, Virginia

Dear Mr. Gardner:

Thank you for your letter of 29 July 1968.

I was not able to stay until the end of the meeting in New Bern on 26 July 1968. However, I did leave with one of the secretaries, for the record, a copy of a letter of mine which was published in the CARTERET COUNTY NEWS-TIMES on 18 July 1968. Apparently this letter was misplaced. It cited an example of unnecessary destruction of a vital marsh and estuarine area in North Carolina. I have modified the letter (enclosed) and would appreciate if it be included as my statement for the official record of the public meeting in New Bern on 26 July.

At the New Bern meeting, there were many statements about "State rights". I am in general accord with those statements. However, as regards the Atlantic Coast marshes, wetlands, and estuarine areas, I believe that the Federal Government should take the lead in establishing standards for their use, preservation and development. They should be inventoried, classified, and used accordingly. In particular, those areas vital as spawning grounds and sanctuaries for migratory fish and wildlife should be under Federal supervision or regulated strictly in accordance with Federal standards.

Sincerely yours,

J. W. Davis, Rear Admiral
U. S. N. (Retired)

Encl.

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REAR ADMIRAL J. W. DAVIS, USN (RET.)
MILLPOINT, OLD NASSAU ROAD
WILLISTON, NORTH CAROLINA 28589

STATEMENT IN REGARD TO THE PROGRAMMED BOAT CHANNEL THROUGH THE CORE SOUND MARSHES INCIDENT TO THE DEVELOPMENT OF THE CAPE LOOKOUT SEASHORE.

The Corps of Engineers has programmed a boat or "borrow" channel from Ocracoke Inlet to Beaufort through the marshlands in Core Sound. I believe this channel is not in keeping with the conservation policies of the United States Department of Interior, particularly when it involves land owned (or shortly will be) by the Federal Government.

As I read the law authorizing the Seashore, its purpose was "***** to preserve for public use and enjoyment an area in the State of North Carolina ***** which shall comprise the lands and adjoining marshlands and waters on the Outer Banks of Carteret County, North Carolina ****". Section 5 of the law states that the Seashore shall be administered "**** for the general purposes of public outdoor recreation, including conservation of natural features contributing to public enjoyment." Yet one of the first major developments in the Seashore is to cut a "boat" or "borrow" channel through the adjoining marshlands, which are the last remaining natural stabilizer of the Outer Banks. The proposed channel would be over 50 miles in length, 160 feet in width, and a maximum depth of 10 feet. Thus in one operation a minimum of 1,000 acres of vital marshlands would be destroyed forever.

Authority for this channel is contained in Section 6 of the law, which provides that the Corps of Engineers shall "undertake or contribute to shore control or beach protection measures **** that is consistent with the purposes of this Act". I consider that the proposed channel is not "consistent" with the purposes of this Act."

The reported purpose of dredging this channel is to obtain "material for sand dunes and the berm". Why not obtain this material by dredging and deepening the present boat channel in Core Sound? This may prove more costly, but the long range benefits would more than offset the added costs and it would be complying with the law by preserving the marshlands. Coincidental with the building of the shore and hurricane protection berm and sand dunes, three (3) inlets would be filled.

It has also been my observation that when drag-lines, dredges, and other earth moving equipment move into an area, very little attention is paid to natural environment. I am just not one of those people who believe that man can improve on God as regards the preservation of our natural resources. As an example, since the livestock were removed from the Outer Banks, it is amazing how much vegetation and grasses have grown on areas that were formerly bare sand; and there are again small sand dunes.

Discounting the illegal aspects of this proposed channel, a more disturbing aspect is the long range adverse effects such a channel would have on the sport and commercial fishing industries. From what I read and am told by marine biologists, the estuarine areas and wetlands (particularly the marshlands) are vital to the survival of the fish resources, as spawning grounds and sanctuaries for maturing. For the five year period ending in 1965 the coastal fish resources from Maine to Florida were down 50% for 18 species important to sport and commercial fishermen. The situation was attributed to the pollution of estuarine areas and the annual loss of thousands of acres of Atlantic coastline wetlands.

I believe this proposed channel would be the first step in the systematic destruction of these marshlands. It would mean more boats, more dredging to provide boat landings and marinas, more people and more indiscriminate pollution and littering of the marshes and Outer Banks. It would provide unlimited access to the Outer Banks and marshlands, and at a prohibitive cost to properly control and police the flow of people and boat traffic in the area.

Arguments favoring the proposed channel are somewhat specious. One is that the channel would provide water transportation for the commercial fisherman in moving their products to markets. Already we have for this a perfectly good and adequate boat channel in Core Sound.

I would also suggest that probably 99% of the seafood products taken from Pamlico and Core Sounds are now moved to the markets by trucks from the communities bordering on these sounds, and which are more convenient and less constly to the fisherman. Another argument is that this channel would help carry away the excess water which builds up in Core Sound during strong northeasters and hurricanes (similar to the "1933 storm"which did so much damage to the Outer Banks when the "wall of water" finally broke through the dunes to the Atlantic Ocean and opened up Whalebone, Swash, Sand Island and Barden Inlet).

On the contrary, it would seem to me that such a channel would aggravate the flooding in the North River area and Beaufort; particularly when three (3) inlets, which ordinarily take some of this excess water to the Ocean, would be closed. One final argument is that the chanel would provide another convenient channel for fish to move in. My reply is that Core Sound is already quite adequate for any anticipated fish movements in this area. Also fish usually moving into and out of the marshlands are there to spawn and seek sanctuary.

During Congressional Committee hearings on the "Estuary Study Bill", the principle was "fully established that estuarine areas should be preserved as the most important seafood habitat of Coastal areas". How then can Executive branches of the Government proceed with a non-preservation project in these marshlands, which is contrary to this established principle of Congress?

In the past three years I have talked with many of the old-timers who have hunted, fished and camped on the Outer Banks throughout their lives. Without exception they concur that this programmed boat channel would be a serious threat to the preservation of these Banks. I am told by them that the physical contour of the Banks has changed very little in the past 30-40 years. I am further told that the greatest conservation step which has been taken in recent years was the removal of the livestock from the Banks. This boat channel would destroy the marsh grasses whose natural dampenening effect on the washing and lapping action of the waves is the most effective erosion control measure, short of reinforced concrete.

I can see no logic or valid reasons for justifying this proposed channel. It seems to me to be a short-range project to obtain "material for sand dunes". For the long-haul, a more permanent project (even if it initially proves more costly) would be to obtain the required material from the present boat channel in Core Sound; and keep open and stabilize the natural inlets; and leave the marshes intact as the last remaining natural stabiliser of the Outer Banks.

J. W. Davis
Rear-Admiral, USN (Retired)

A

COMPREHENSIVE ESTUARINE PROGRAM

FOR THE

STATE OF NORTH CAROLINA

A Report Prepared
By
The Estuarine Study Committee
for presentation to
The Inter-Agency Council on Natural Resources

May, 1968

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FOREWORD

On November 21, 1967, the Inter-Agency Council on Natural Resources considered the problems relating to the public use of North Carolina's estuaries and explored means of more efficiently managing these resources. The proceedings of this meeting, consisting of contributions from the Department of Conservation and Development, the Wildlife Resources Commission, the Department of Water and Air Resources, and the Attorney General's Office, have been furnished to all members of the Council and are available for public distribution.

As a result of the November meeting, the Council designated an Estuarine Study Committee, which was to develop a comprehensive state program for multiple use of the State's estuaries, and to present this program to the Council in time for implementation by the 1969 General Assembly. Members of the Estuarine Study Committee are:

NAME	AFFILIATION
Clyde P. Patton	Wildlife Resources Commission
David A. Adams	Commercial & Sports Fisheries
Chester Davis	Winston-Salem Journal-Sentinal
R.J.B. Page	Department of Water & Air Resources
Milton S. Heath, Jr. (Advisory)	Institute of Government, UNC
Parks H. Icenhour	Attorney General's Office
Frank Turner	Department of Administration
W. C. Bell	State Planning Task Force

The Study Committee was divided into the following subcommittees, each of which was assigned a specific task:

A. Survey of Resources	Patton (Chairman), Adams, Davis, Page
B. Means of Control	Heath (Chairman), Icenhour, Page, Turner
C. Jurisdiction	Turner (Chairman), Bell, Heath, Icenhour
D. Public Awareness	Davis (Chairman), Adams, Bell, Patton

The Subcommittee findings form the basis for the estuarine program proposed in this report. Reports of Subcommittee A, B, and C are included as appendices. Much of the work of Subcommittee D will be contingent upon acceptance of this report by the Inter-Agency Council.

RECOMMENDATIONS

I. Introduction

For generations, the estuaries received little public attention, but recent years have seen a blossoming of both public and private interest in these lands and waters. Today, we are faced with a variety of uses -- fishing, navigation, real estate, hunting, boating, other forms of recreation, industry -- actively competing for the State's estuaries. Although all uses are justified in their own right, many of them conflict with each other, some cannot co-exist in the same local area, and some pre-empt any alternative uses for all time to come.

The program described herein is designed to provide a means for allocating uses throughout the estuarine system in such a manner as to ensure that future generations of North Carolinians may participate in the diverse coastal activities that we enjoy today, supported by facilities and services adequate to serve their needs.

II. Elements of the Program

A. Fixing Authority. The Department of Administration should be designated the agency responsible for the State's estuarine program.

B. Providing Coordination. Provisions for full coordination among all affected State and local agencies should be required. This responsibility should be placed upon the Department of Administration by statute. This will provide for cases which vary in the agencies and local interests which they affect, and which cannot be covered by a Board or Committee with established membership. However, there should be an Estuarine Council, composed of representatives of affected State agencies, supplemented by private citizens appointed by the Governor. Representatives of governmental agencies should include the State Board of Health, the Wildlife Resources Commission, the Department of Conservation and Development, and the Department of Water and Air Resources. Non-governmental members should include representatives of the academic community and residents of the estuarine region.

C. Providing Control Authority. The estuarine agency should be given authority to control the uses of estuarine lands and waters through the following processes:

1. Reviewing all public projects and programs affecting estuarine lands and waters in coordination with other State agencies and transmitting its suggestions and recommendations to the proper authority.

2. Acquiring interests in estuarine lands and waters in the public interest through purchase, gift, lease, easement, or condemnation. Requests for acquisition may come from the program staff or any State agency responsible for the natural resources therein or for the potential public use of such resources. Upon approval of the Estuarine Council, the Department of Administration would acquire the desired interest in the manner provided in Chapter 146 of the General Statutes, and delegate administration and management to the appropriate natural resource agency. Based upon preliminary estimates, it will probably be necessary to acquire 100,000 to 150,000 acres for fish, wildlife, and recreational purposes.

3. Maintaining a continuing inventory of the State's estuaries in order to provide a basis for decisions.

4. Regulating private uses which may affect the public interest through a permit system which would:

    a. require permits for all alterations below the elevation of Mean High Water adjacent to the State's estuaries.

    b. provide for a review of all permit applications by other interested State agencies and the Estuarine Council prior to action by the estuarine agency. Where a federal permit for work in navigable waters is also required, the state permit will represent the State's estuarine area interests, and will be consolidated with the views of other agencies and local governments by the Department of Water and Air Resources in the formulation of an overall State position on the issuance of a federal permit by the Army Engineers.

    c. provide for public hearings on permit applications, upon request of the applicants or opponents.

    d. provide an appeal procedure through the Department of Administration and through the courts, in the event a permit denial or approval is contested. The proposed permit controls do not represent a major departure or change in policy. Rather, they are an extension of controls already being exercised through a permit procedure administered by the Corps of Engineers (covering lands under navigable waters), and the granting of easements by the State Department of Administration (covering State-owned lands).

D. Providing Staff. A small technical staff, under the direction of a trained Natural Resources Administrator, should be provided. The staff will be primarily responsible for preparing master plans for estuarine use and maintaining an inventory of estuarine land. It will have to draw heavily on field personnel of the Wildlife Resources Commission, the Department of Conservation and Development, the Department of Water and Air Resources, and the State Board of Health for field investigations and technical assistance.

E. Providing Adequate Funds. Estimated fiscal requirements for the 1969-71 biennium are summarized below:

(1) Operating Funds[1]

Salaries	1969-70	1970-71
Natural Resources Administrator (Grade 73)	10,320	10,848
Community Planner I (Grade 69)	8,520	9,384
Wildlife Biologist II (Grade 69)	8,520	9,384
Draftsman I (Grade 56)	4,584	5,040
Steno II (Grade 54)	4,176	4,584
Sub-total	36,120	39,240
Supplies & Materials	1,000	2,000
Postage, Tel. & Tel.	500	1,000
Travel Expenses	1,500	3,000
Equipment	1,500	1,000
Total	40,620	46,240

[1] The above funds should be requested as a part of the 1969-71 "B" Budget request of the Department of Administration.

(2) Land Acquisition, including legal fees, surveys, etc.[2]	500,000	500,000

[2] These funds would best be provided on a continuing basis through an annual appropriation of $375,000 from the General Fund and allocation of 1/8 of 1% of the net proceeds of the taxes on motor fuels levied under G.S. 105-434 (estimated to be approximately $125,000/yr. and less then 1/4 of the contribution to the highway fund from non-rebated marine fuel taxes) to the estuarine acquisition program. Federal funds, equivalent to the State's contribution, may also become available through provisions of the Land and Water Conservation Fund Act of 1965.

F. Providing Surveillance, and Enforcement. The Department of Administration currently has no field enforcement capability. Rather than create capability in this agency, law enforcement personnel of the Wildlife Resources Commission and the Department of Conservation and Development, Division of Commercial and Sports Fisheries, should be assigned the mission of maintaining surveillance over coastal alterations and informing the Department of Administration of acts of trespass upon State estuarine lands and waters and violations of permit requirements and provisions. The Department of Administration, with the assistance of the Attorney General's Office, would be responsible for taking any necessary legal action to protect the State's interests. Although this procedure appears unwieldy and contrary to normal administrative procedure, both enforcement agencies have a deep interest in and responsibility for the future of the State's estuaries and hopefully would be able to undertake the additional work in conjunction with their normal duties.

OUTLINE OF PROPOSED LEGISLATION

I. Dredge-and-Fill Permits or Regulations

New legislation will be needed in order to establish a permit system for dredging, filling, or otherwise altering privately-owned coastal marshlands. Probably a bill similar to S.B. 400, as originally introduced in 1967, would provide an adequate working model. If rule-making powers are desired in addition to or as an alternative to permits, an existing Massachusetts statute might be used as a model. Proposals under consideration in the San Francisco Bay area will also provide useful working guides.

II. Land Acquisition Program

Adequate estuarine land acquisition authority already exists in the Department of Conservation and Development /G.S. 113-226(a)/. However, with program responsibility shifted to the Department of Administration, it may be necessary or desirable to enact a statute transferring this authority. This legal issue should be explored by the Attorney General's Office.

III. Administrative Provisions

New legislation will probably be needed to spell out administrative organization details.

In order to avoid double-office holding questions, legislation would be needed to set up an Estuarine Council with governmental powers.

New legislation is probably desirable to spell out administrative organization for program operation within the Department of Administration. Although it might be possible to carry out the program without new legislation concerning administrative organization and powers, it would be better to spell these matters out for the sake of clarity. Some thought needs to be given to the relationship of C & D's existing statutory responsibilities concerning estuaries (and DWAR's existing administrative responsibilities) to the proposed new responsibilities of the Department of Administration.

IV. Financing Provisions

The matter of financing can be handled simply as an appropriation item, unless some special or new revenue source is to be earmarked for this program.

APPENDICES - SUBCOMMITTEE REPORTS

I. A Preliminary Survey and Evaluation of the Coastal Marshes and Wetlands of North Carolina.

II. An Analysis of State Regulatory Procedures in Estuarine Areas.

III. Jurisdictional Considerations in Administering a Comprehensive Estuarine Program.

APPENDIX I

A PRELIMINARY SURVEY AND EVALUATION OF THE COASTAL MARSHES AND WETLANDS OF NORTH CAROLINA

Introduction

Existing publications of value on the status of our marshlands are limited to a U. S. Fish and Wildlife Service Wetlands Survey Report in 1954, and a wetlands distribution and management report by Mr. Kenneth A. Wilson of the North Carolina Wildlife Resources Commission in 1962, both of which classified the State's wetlands by type according to existing vegetative species, and gave estimated acreages of the several types. Although well done, these reports pertained almost exclusively to wetland vegetation types and acreages and associated land animals and waterfowl.

More recently, and unpublished report of November, 1967, by Mr. George E. Burdick of the North Carolina Wildlife Resources Commission brought acreage figures up to date by estimating the extent of alterations to the various coastal marshlands types by county which have occurred during the past 15 years. During this period, an estimated 28.5% of our coastal salt marshes have been altered by ditching, dredging, and dredge-and-fill operations. These alteration figures portray a trend toward ever-increasing elimination of natural marshlands.

Also unpublished is a documented report by Dr. David A. Adams and Mr. James T. Brown of September, 1965, estimating a loss of approximately $200,000 to the citizens of Brunswick County from oyster mortalities alone as a direct result of uncontrolled run-off of spoil materials from established disposal area rights-of-way adjacent to some six miles of Intracoastal Waterway maintenance dredging operations in that county. The resulting layer of silt and mud from this effluent outside the established spoil areas also destroyed significant quantities of clams and other animals, as well as plants characteristic of that environment. Damages occurring within the 1000-foot area of perpetual easement were not considered.

We recognize that a coordinating plan must be prepared to control the use of estuarine areas and which will guarantee preservation of enough of it to sustain fish and wildlife resources and their subsequent utilization by man, while also accommodating the many other valid uses. This subcommittee was assigned the task of a preliminary survey and evaluation of the existing uses, needs, and trends affecting our estuarine resources. Since no program recognizing only the interests of a single or even several entities can become an effective guideline for benefits of the majority, a plan is required which will incorporate the needs of navigation, industrial and urban development, real estate, recreation, fish and wildlife and other interests. Literally, a master plan must be developed which will give each it's proper recognition and perspective. The primary objective of the preliminary work of this subcommittee is to evaluate the situation in order to obtain insight into the current status of the resource and to provide estimates of the quality, types and amounts of coastal wetlands that are required to sustain fish and wildlife resources.

Utilizing existing personnel and funds, during limited time available, this report at present represents the progress to date of only the fish and wildlife interests.

Objectives

The primary objective of this survey was to provide preliminary information on the current extent of North Carolina estuarine areas as a basis for formulating a unified approach toward the implementation of an effective program of acquisition in the interest of our citizens now and of the future. Toward this objective, priorities have been assigned so as to focus attention on those estuarine areas considered most valuable, particularly to wildlife and fisheries resources. Necessarily, these must lay the groundwork for future efforts to preserve and properly manage these resources.

Procedures

Aerial photograph index sheets were secured from the U. S. Department of Agriculture and the U. S. Department of Commerce, Coast and Geodetic Survey. Photos covering all of the coastal North Carolina counties containing significant marsh lands were purchased from these two sources. The photographs are of the scale 1-inch of photograph equals 20,000 inches or 1667 feet on the ground.

All photos were separated by counties. Individual photos were used out in the field and compared with vegetation and water conditions on the ground.

Priority types were designated as I, II, III, or IV (attached marshland guidelines).

A transparent plastic acreage grid was utilized to determine acreage.

Marshland acreages, when known to fall within state- or federally-owned areas, such as Gull Rock (state-owned), and Lake Mattamuskeet (federally-owned), are included in the totals.

Guidelines for Wildlife and Fisheries Values

Priority I	Includes areas of highest value to wildlife and/or fisheries resources. All regularly flooded salt marshes, as well as other types in certain locations, are included.
Priority II	Includes areas of second highest value to wildlife and/or fisheries resources. All freshwater types not in Priority I are included. Irregularly flooded salt marshes in certain locations are also included.

Priority III Includes areas of third highest value to wildlife and/or fisheries resources. Only irregularly flooded salt marshes are included. It is recognized that areas with this priority can sometimes be made more valuable to both wildlife and fisheries by proper management techniques.

Priority IV Includes areas which would be unrealistic to acquire due to location or current use, or areas which were judged as not being needed for fish and wildlife purposes.

NOTE: Some intertidal mud flats and small creeks are included in the above priority acreages.

Discussion

Projects planned by engineers often completely overlook wildlife, fisheries, and other recreational values. Alteration of coastal salt marshes, under various projects such as mosquito and other pest control, clearing, road construction, drainage, industrial and real estate development, and navigation, has occurred without due regard for natural resources values.

Maintaining a degree of compatability between those factors which result in alteration or destruction and the natural resources being affected is a difficult task, however, it is recognized that we cannot afford further delay in the development of a program which will effect coordination of all interests, including development and the preservation of the State's estuarine resources.

Findings

A tabular summary of the preliminary marshlands acreages which have been assigned a "desirability" or "value" priority is presented below:

Table of Data

County	Priority				Spoil Altered
	I	II	III	IV**	
Brunswick	13,800	500	800		400
New Hanover	4,700	1,300	900		500
Onslow	9,400	2,200			700
Pender	4,200	800			500
Carteret	34,600	20,600			50
Craven	2,500	900			
Beaufort	3,700	3,100	400		
Pamlico	16,400	1,600	900		
Hyde	19,900	11,400	3,300		
Dare*	9,700	300			
Currituck*	3,800				
TOTALS	122,700	42,700	6,300		2,150

* Incomplete, due to inadequate photo coverage. Approximate marsh acreage in Dare County is 21,200; Currituck, 23,600.

** Acreage undetermined at this time.

Alongside the inland waterway the appropriate right-of-way for the waterway was lined off using information secured from the U. S. Army Corps of Engineers, including property easements from Bogue Sound, North Carolina to Little River, South Carolina. Where spoil had extended beyond the legitimate rights-of-way, and filled existing marshlands with sediment and debris from dredging, this acreage of spoil areas was also determined and listed under another category as "marshland altered by spoil." Marshland acreages and spoil deposits falling within the navigational rights-of-way were not calculated.

Recommendations

A staff of trained personnel should be assigned projects pertaining to inventory and to the development of means to preserve estuarine areas, including existing marshlands and adjacent water areas. From recommendations of these personnel should come the data to serve as a basis for management of the state-owned areas.

A program should be developed and implemented which will ensure a continuing inventory of our estuarine resources, a determination of trends in the quantity and quality of these resources, and the development of a program for coordinate management, utilization, and preservation.

It is recommended that the State develop means to preserve at least 100,000 acres of Priorities I, II, and III marshlands in the State as public lands.

AN ANALYSIS OF STATE REGULATORY PROCEDURES IN ESTUARINE AREAS

I. Existing North Carolina Programs and Laws concerning Estuarine Management and Conservation.

A. Present Programs and Authorization.

(1) In General. The broadest authority over estuaries vested in any state agency in North Carolina is granted to the Department of Conservation and Development, acting primarily through its Division of Commercial and Sports Fisheries. General jurisdiction is granted to this Department over the conservation of marine and estuarine resources -- which include coastal and ocean fish and fisheries, related plant and animal life, and the entire ecology supplying them. (G.S. 113-129, 113-131)

Comprehensive land acquisition powers to lease, purchase and condemn estuarine lands in the best interests of conserving marine and estuarine resources are conferred on the Board of C & D by G.S. 113-226. (The State Lands Act governs acquisition procedures, which are the responsibility of the Department of Administration with the approval of the Governor and Council of State. G.S. 146-22 and 146-24). Other land acquisition powers that might be used in estuaries include the authority of the Board of C & D to acquire land for state forests and parks (G.S. 113-34).

The State Planning Task Force of the Department of Administration is serving as coordinating agency for North Carolina with the 3-State Coastal Plains Regional Commission (North Carolina, South Carolina, and Georgia). This program will serve in its region (which includes 45 North Carolina counties) as a focus for coordination of State resource and development programs. Its principal source of funds will probably be federal moneys under the Public Works and Economic Development Act. In its work with local development projects and agencies in the coastal counties, the Coastal Plains Commission will undoubtedly play a role in coordinating development with estuarine management and conservation.

The aforementioned state agencies, along with several others, carry on activities and programs that have some existing or potential bearing upon estuarine conservation and management. These include the following:

Department of Water and Air Resources -- Stream Sanitation Law; fishkill investigations (in cooperation with C & D and Wildlife Resources Commission); rivers and harbors improvements, hurricane protection and coastal erosion prevention; Capacity Use Areas Law.

State Ports Authority development of harbors and promotion of commerce through North Carolina ports.

State Board of Health -- mosquito control activities (including supervision of creation of mosquito control districts); septic tank controls.

State Department of Agriculture -- Plant Pest Control Law.

State Recreation Commission -- advisory and consulting services involving recreational facilities, needs and opportunities.

Department of Administration (State Planning Officer) -- data collection and analysis, and special studies affecting natural resources and related matters, as well as items previously noted.

Wildlife Resources Commission -- game and inland fish management areas.

Institutions of higher learning -- programs of research and investigation, especially at the Chapel Hill and Raleigh branches of the University of North Carolina under the Water Resources Research Act, the Federal Water Pollution Control Act, Hatch Act, the Sea Grant program, and the Coastal Studies program; also the Institute of Marine Sciences; and technical institute and community college programs.

(2) Department of Administration Easements. Under the provisions of N.C. G.S. 146-6 a riparian land owner may request an easement to fill submerged land fronting his property. The views of adjoining riparian land owners are solicited, and the effect of the proposed filling on navigable waters is evaluated. When granted, there is a fee of $100 to cover the cost of the administrative work involved. For an additional $100 a quit-claim deed may be provided by the Department of Administration upon approval by the Governor and the Council of State. Any material dredged from State-owned submerged lands to fill on private property is charged for at the rate of 25¢ per cubic yard for the first 1,000 cubic yards; 15¢ per cubic yard for the next 1,000; and 10¢ per cubic yard for any over 2,000 cubic yards.

The volume of requests for easements is not large, and more are denied than are granted. An effort is made to hold approvals down to small tracts. This appears consistent with efforts to protect the natural condition of estuarine areas.

(3) Permits for Work in Navigable Waters. A Federal law passed in 1899 requires that anyone proposing work which will affect navigable waters secure a permit from the Secretary of the Army. (33 U.S.C. § 403). This is administered through the Army Engineers. The law is a Rivers and Harbors Act, and the Chief of Engineers has stated that a decision on issuing a permit must rest primarily on the effect of the proposed work on navigation. (However, in recent years more consideration has been given to factors other than navigation in denying the issuance of a permit. However, a 1968 Florida Federal District Court decision held that a permit can only be denied for navigational reasons).

The process in this State consists of the issuance of a public notice by the District Engineer when he receives an application for a permit; the circularization of affected State agencies for their comments on this public notice by the Department of Water and Air Resources; and the formulation of a State position on the matter and response to the District Engineer by the Department, which has been designated by the Governor to coordinate State comments in these matters. The Army Engineers are not bound to accede to these comments. However, it is their stated policy that in cases where a proposed structure is unobjectionable from the standpoint of navigation, but State or local authorities decline their consent to the work, it is not usual for the Corps of Engineers to issue a permit. Also, when it is proposed to deepen or otherwise modify streams or bodies of water, the District Engineer is directed to coordinate with State and Federal fish and wildlife agencies, and to try to reach a compromise solution where there are conflicting views.

In a typical year, between November of 1966 and 1967, 74 permit application cases were handled by the State. In one case denial was recommended, on the grounds of the effect of the proposed work on State-owned submerged lands. In 24 cases suggestions were offered or the inclusion of conditions in the permit was requested.

(4) Registration of Dredging Equipment. In addition to the Army Engineers permits, state legislation was proposed in 1967 in North Carolina which would have required permits for dredging and filling of coastal marshlands. This permit authorization was turned down by the General Assembly, however, and a compromise law was passed which merely requires registration of dredges, draglines, and other heavy equipment used in dredging and filling publicly owned tidelands and marshlands. This law is administered by the Department of Water and Air Resources (G.S. 146-6.1).

(5) Present State Ownership of Estuarine Areas. There is no current inventory of State-owned lands in the estuarine areas of North Carolina. A 1923 report to the Board of Education by a surveyor, Eric Norton, on State-owned marshes is on file, but it is doubtful that this report would be helpful in estimating state ownership. In order to secure an estimate of the extent of State-owned marsh lands it would be necessary to take the following steps:

(a) To define the extent of the marsh lands which may have originally been State-owned -- a mixed legal-surveying problem of some difficulty.
(b) To subtract from the original State-owned acreage all lands previously conveyed away by the State.
(c) This step would entail examining the grant files in the office of the Secretary of State for early grants, the records of the Literary Fund for grants during its existence, and the records (probably the minutes) of the State Board of Education.

Because of the lengthy and expensive process that would be involved in arriving at such an estimate, it is felt that it would be preferable to limit this title searching problem to the minimum needed -- to wit, to identify lands needed for conservation purposes and then search the title on these lands only.

(6) Construction of Marsh Land. It appears possible that, in addition to protecting and controlling estuarine marsh land, this resource might be augmented by creating new marsh. This would entail grading islands or other areas along waterfront to within the tidal range, and planting appropriate vegetation on it. So far there is no available experience or research on it, and none programmed.

However, a practical test may be possible on a very small scale, in connection with a proposed private waterfront improvement on a creek off the Atlantic Intracoastal Waterway near Wilmington. In this case the owner applied to the Army Engineers for a permit to dig a small navigation channel along the shore in front of his property. The State recommended denial of the permit, on the grounds that public marsh would be destroyed; the area affected was relatively small, but this stand was taken as a matter of principle, and the permit was denied. The owner expressed willingness to create a spoil bank on the creek side of the channel, grade it to the proper elevation, and plant local marsh grass on it, to an extent that would provide more marsh than was destroyed. The matter is under investigation, as his proposal would appear to overcome State objections.

If research and experience should prove some such effort feasible, it is possible that work on a larger scale would be justified. The spoil banks along the Intracoastal Waterway and other channels might be used for this purpose.

There is a further possibility, along the lines of replacing unproductive marsh grass with productive varieties, according to specialists at North Carolina State University. There are large expanses of Black Rush marsh, which are unproductive, and which might warrant such treatment. The matter has had no consideration so far, and the practical difficulties of making the change have not been evaluated at all. However, as our available marsh lands are encroached upon, this possibility may very well increase in economic justification.

B. Legal Aspects of the Ownership Management and Use of Estuarine Areas.

(1) The Rice Report. A lengthy background paper has been prepared by the Institute of Government concerning the legal aspects of ownership, management and use of estuarine areas. The author is Professor David Rice of Boston University Law School, who prepared the paper as a research associate at the Institute during the summer of 1967. This paper reviews the history of estuarine ownership in North Carolina starting from its English common law origins; examines the navigability doctrine as interpreted in this State; and briefly reviews other relevant legal principles (such as adverse possession, accretion and reliction, deed construction).

This research was supported by a grant from the Belle Baruch Foundation, through the Unversity of South Carolina. The Rice report is being published simultaneously with this report. It will also appear in a revised form in an article in the spring 1968 issue of North Carolina Law Review.

(2) *Constitutional Issues.* At least two kinds of legislation have been adopted in other states, whose application to particular marsh lands may raise constitutional questions: wetlands alteration permit laws, and zoning laws or ordinances. The principal constitutional issue inherent in such matters is whether, in a particular case, the application of the law may amount to an uncompensated taking of property without due process of law. The issue has not been considered or determined directly in North Carolina.

The Rice Report touched briefly upon the constitutional issues involved in State regulation of estuarine lands for conservation purposes in the following passage:

> The courts of several states have considered the proper limits of the legislative exercise of the police power in cases where the laws enacted were designed to deal with estuarine resource and land problems. In North Carolina, the statute making it unlawful to discharge any poisonous or deleterious substance harmful to fish into the waters of the State -- a predecessor of the State's present water pollution control legislation -- was upheld in the face of a due process of law attack but was found to make an arbitrary discrimination to the extent that all companies chartered prior to the enactment of the statute were exempted from its provisions. *State v. Glidden*, 228 N.C. 664, 46 S.E. 2d 800 (1948). In Massachusetts, an enactment requiring a permit for dredging in marsh lands survived a due process claim of invalidity although the court cautioned that the conditions and restrictions put into the permit by the State could not be so limiting that the net effect was to so confine the use of the property as to amount to its taking without compensation. *Commissioner of Natural Resources v. S. Volpe & Co.*, 349 Mass. 104, 206 N.E. 2d 666 (1965). The kinds of restrictions that may amount to a taking of property are indicated by a recent Connecticut decision, which invalidated a town flood plain zoning ordinance. *Dooley v. Town Zoning Commission of the Town of Fairfield*, 151 Conn. 304, 197 A 2d 770 (1964). The land affected by the ordinance was tidal marsh land, 91% of which was periodically flooded by a tidal estuary, and the remainder of which had been inundated by extraordinary floods of record. The stricken ordinance would have limited the use of this land to open space uses, such as parks and playgrounds, landings and docks, wildlife sanctuaries, farming, vehicle parking, unless a special exception was obtained. These restrictions upon profitable use of developed land were held to be unreasonable and confiscatory as to property, some of which was under contract for residential development and some assessed for sewer line.

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* David A. Rice, *Estuarine Lands of North Carolina Legal Aspects of Ownership, Management, Use and Control*, Institute of Government (1968), pp. 51-52.

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It is apparent from this commentary that the application of zoning laws or ordinances to coastal marsh land preservation may in some circumstances be questioned on constitutional grounds. Careful drafting of the law or ordinance may help to limit this risk. One legal expert concerning land use regulation made this comment concerning the Dooley case (supra):

> The point to be made is that the drafters of the ordinance did not sufficiently enumerate permitted profitable uses. Possible additional uses for this area might have been golf courses, picnic grounds, skeet shooting ranges, transient amusement enterprises, storage yards for scrap metal, roadside stands for the sale of food or fishing bait, riding stables, etc. It is not enough for the municipality to say that a variance probably would be granted if application were made for such a use. As here, a court may strike the ordinance as a whole if the listed permitted uses are inadequate. Furthermore, filling in the flood plain area should be permitted so as to permit the owner to raise the land above the flood-danger line, at least to the extent that such filling would not cause constriction of the flood channel of the watercourse. *

The problem may not be entirely amenable to drafting techniques, however. One author reviewing a series of recent decisions involving marsh land preservation and other "open land zoning," noted the following conclusions:

> The major problem encountered in the use of all these techniques is posed by the traditional view of the courts that every property owner must be afforded a reasonable range of alternative uses which he can make of his property
>
> . . . .
>
> Perhaps the major lesson to be drawn from the cases is that most courts, in the absence of special circumstances, appear reluctant to authorize "sterilization" of land through the zoning process, where the major purpose of the zoning regulations appears to be preservation of open space. Since this reluctance takes effect in constitutional terms, statutory correction would be of little avail. But fortunately, to the extent that the courts are a roadblock in this area, they are a roadblock which can be by-passed through the public acquisition of property rights -- and it would appear that in most cases where the public interest in preservation of particular open space is strong, the public should be willing to pay the cost of that open space rather than imposing the entire burden on an unwilling property owner. **

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* Beuchert, Recent Natural Resource Cases, 4 Natural Resources Journal 445, 447 (Jan. 1965).

** Green, "New Trends in Zoning as Recognized by Court Decisions," 6th Annual Institute on Planning and Zoning, Southeastern Legal Foundation, Dallas, Texas (Sept. 1965).

To like effect were the observations of another author, after reviewing some of the same cases:

> Zoning open land areas prone to flooding requires a forced development decision. If harm to certain kinds of future development and to the land, is to be avoided, zoning must be pre-planned on the basis of hydraulic data and permitted uses written into the regulations accordingly. But it is notoriously evident that restrictions on the basis of long-term predictions in the public interest are never easily accepted by interests presented with profitable opportunities for such gainful uses of property as our ever increasing population presents. There is, however, a trend away from the purely nuisance, or "pyramid" use of zoning toward planning and zoning toward the "best" integrated uses of land. As earlier observed, the exclusive zoning of industrial areas, sustained by some courts, is a hopeful indication of a new direction for zoning in accordance with real comprehensive planning. *

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* Cooter, "Land Planning and Land Use Controls for Flood Damage Prevention," Appendix G to Report by Secretary of H. U. D. to the President, Insurance and Other Programs for Financial Assistance to Flood Victims (1965).

II. Experience in Other States*

A. General Summary.

(1) Planning Programs. Extensive planning programs for estuarine conservation and management are underway in California, Oregon, and Maryland. The California program involves San Francisco Bay and includes interim permit controls over dredging and filling during the planning period; its twenty-three research and planning studies are budgeted at nearly one-quarter million dollars a year for several years.

(2) Regulation. A common denominator of regulation in all or most of the states is participation in Corps of Engineers navigation permit proceedings, general water pollution control laws, fish and game regulations, and some controls exercised in conjunction with disposal or lease of state-owned underwater lands.

Legislative controls beyond these routine features include --

(a) Permit requirements for dredging, filling and other alterations in coastal wetlands (Massachusetts, Maine, New Hampshire, and Rhode Island). These laws usually go beyond the Corps of Engineers permits and state lands controls, in that the wetlands permits apply to privately-owned uplands, not merely to state-owned lands and lands under navigable waters. In Massachusetts, the wetlands controls are accompanied by power to condemn lands if a "taking" is involved. In addition to its permit law, Massachusetts has enacted a related statute that permits a "rule-making" approach, authorizing the adoption of regulations to control wetlands alteration on a regional basis.

(b) Establishment of bulkhead lines to control leasing (Texas) or dredging and filling (Florida).

(c) As previously noted, interim permit controls over dredging and filling of coastal marsh lands have been adopted by a regional agency in California, to forestall development during the planning period of the agency's program.

(d) Some efforts have been made to use local zoning machinery for coastal marsh land preservation. As indicated elsewhere in this report, though, these efforts have encountered serious legal obstacles in more than one state. The State of Delaware has reflected on its Comprehensive Plan Map some coastal wetlands for conservation purposes, but this has not been implemented by zoning.

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* The information contained in this section is derived from correspondence with state agencies responsible for estuarine management, supplemented by information from Mr. George P. Spinner, Project Director for the Marine Resources Committee.

(3) Acquisition. Massachusetts has enacted authority to acquire lands by condemnation if a "taking" is found by the court which reviews proposed wetland regulation. At least two other states, in addition to North Carolina, have legislative authority for condemnation of estuarine lands (Connecticut and New York). Most of the state programs, however, must rely on voluntary acquisition..

While land acquisition for estuarine conservation has been conducted only on a limited scale in most coastal states, extensive programs are underway or being planned in several states involving thousands of acres of land. The states with substantial acquisition programs or plans include New Jersey, California, Maine, Connecticut, Rhode Island, and Delaware. State acquisition is often supplemented by acquisition by private conservation groups and federal agencies.

New York has pioneered a program of state-local cooperation under the Long Island Wetlands Act. This provides for state cost sharing in maintenance, operation and development of locally-owned wetlands that have been dedicated to conservation purposes.

(4) Budget. Low levels of funding for land acquisition or regulation programs have often hampered state estuarine conservation activities, but there are exceptions. For example, the State of Maine has spent $5 million for park lands plus $20,000 annual for water fowl wetlands. Connecticut is spending about $500,000 in the current biennium for acquisition. California's planning budget has been substantial (almost one-quarter million dollars annually for several years). Passage of a multi-million dollar Green Acres bond issue by New Jersey voters in 1964 has resulted in large state salt marsh acquisitions. In other states substantial operating and acquisition budgets may evolve for some programs now in the planning stage or just getting underway. Use of U. S. Land and Water Conservation funds for estuarine acquisitions represents a significant potential funding source.

(5) Program Goals. Only limited information is available on program goals, except in broad terms suggestive of holding the line to the extent feasible, or of attempting to acquire or control all remaining undeveloped acreage.

(6) Agency. A considerable diversity of administering agencies exists. In several states (Massachusetts, New York, and Rhode Island) there is coordinated administration by several operating divisions of a single natural resources department, though with some local participation in control decisions. Administration is divided in most other states among several agencies. Combined boards, such as the Maine Wetlands Control Board, are used in several New England states to make decisions on permits for wetland alterations or leasing of state lands.

(7) Coordination. Little formal provision appears to be made for coordination of development and conservation, except by boards with diverse representation (such as the wetlands control boards) or in the exceptional case where all

affected program interests are concentrated within a single state department. The general pattern is one of informal coordination among affected agencies.

B. State-by-State Resume.

Alabama. Regulation: Alabama authorizes its State Docks Authority to establish "harbor lines." When such lines are established, the Docks Authority has supervision and control over all activities landward of the harbor lines. In the absence of harbor lines, the Department of Conservation exercises similar authority over the area below mean high tide. State ownership of the area below mean high tide is said to be "well established." Because of having very limited estuarine areas, the State is seeking to preserve all of the existing areas. Agency: Responsibility for regulation is divided between the State Department of Conservation -- which includes Divisions of Administration, Forestry, Game and Fish, Seafoods, State Lands, State Parks, and Water Safety -- and the State Docks of Authority. The Department of Conservation is authorized to acquire lands (including estuarine areas) in connection with its fish and game programs. Funding. Total state program spending for protection, conservation and research activities is approximately $300,000 annually. Court Tests: State ownership of areas below mean high tide is reported to be "well established." Apparently there have been no court tests concerning validity of regulatory legislation. Coordination: Internal coordination of state programs affecting estuaries is carried out between the Conservation Department and the Docks Authority. Both of these agencies coordinate with Corps of Engineers and the Department of Interior on federal-state matters, including Corps permits for projects affecting navigable waters. The Governor's Office coordinates the efforts of the State's industrial development agencies with the State's conservation programs.

California. (1) California is in the midst of an extensive planning program for estuarine conservation in one area, the San Francisco Bay, begun with enactment of a legislative framework in 1965 and scheduled for completion in 1969. The planning agency, the San Francisco Bay Conservation and Development Commission was directed to study the bay, prepare a comprehensive conservation and development plan for the bay and its shoreline, and (as an interim measure) to protect the bay during the planning period by controlling dredging and filling by permits during the planning period. Through 1966 the Commission had issued 25 interim permits, denied 5 permits.

Presently about 50% of the San Francisco Bay is state-owned, 20% city or county-owned, 5% federally-owned, and 25% privately-owned.

This study commission has projected 23 separate staff or consultant reports dealing with the bay as a resource; predicted future development; planning for transportation, and for land and water use; and plan implementation. The annual Commission budget has been substantial -- e.g., $243,924 in fiscal year 1967. The initial studies have been completed, but the Commission is finding that the final report -- dealing with funding and powers to implement its estuarine plan -- is taking longer than anticipated.

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(2) The San Francisco Bay Commission, in April 1968, published a comprehensive 7-volume report on Powers and Money Needed to Carry Out the Bay Plan. (A summary pamphlet version is also available). This report reviews in detail the alternatives available to the area for controlling bay filling activities, and for planning, administering and financing a program. The report provides an excellent source of information in depth for other states and areas. It includes a useful analysis of the pros and cons of the various revenue and organizational options, and an extensive review of the legal precedents bearing upon regulation of estuarine land use.

(3) A similar planning process has been proposed for the Humboldt Bay area in California.

Connecticut. Regulation: The removal of sand and gravel from lands under tidal and coastal waters, and the erection of structures and works in tidal, coastal and navigable waters, are regulated by the Connecticut Water Resources Commission. This affords some control over dredge-and-fill projects, but the State has no jurisdiction over filling of tidal marsh from inland by means of dump trucks and bulldozers. Acquisition: The State of Connecticut claims title to all lands below Mean High Water. However, no demarcation lines have been established, and over the years, private interests have reportedly exercised claims including most of the tidal marshes.

The Connecticut Board of Fisheries and Game is authorized to acquire tidal marsh by gift, lease, purchase, or condemnation. Reportedly, the State has lost about half of its tidal marshes since 1914. Of some 14,800 acres that remain, the Board of Fisheries and Game owns about 4,200 acres and hopes to acquire another 7,000 in the next few years. The Board is recommending acquisition of the remaining 3,600 acres by private conservation agencies or municipalities. A wetlands committee has been organized by private conservation groups, and the U. S. Bureau of Sports Fisheries and Wildlife is studying the establishment of a national wildlife refuge. Agency: As indicated above, acquisition of tidal marsh is primarily performed by the Board of Fisheries and Game, while regulatory powers are vested in the Water Resources Commission. Funding: Spending for tidal marsh acquisition by the Board of Fisheries and Game during this biennium is expected to total about $500,000. Court Tests: None, other than litigation concerning common law ownership rights. Coordination: At the state level, coordination of conservation and development activities in estuaries is carried out by the State Development Commission and the State Highway Department, on behalf of development, and by the Department of Agriculture and Natural Resources, the Park and Forest Commission, the Board of Fisheries and Game, and the Water Resources Commission on behalf of conservation. A comprehensive state plan for development has been prepared by these agencies and is coordinated with local and regional plans.

Delaware. Regulation: The Delaware State Planning Office has reflected on its Comprehensive Plan Map a substantial portion of Delaware's coastal wetlands for conservation purposes. This action has reportedly been used as a weapon in resisting minor subdivision development, but its ability to restrain major developmental encroachments has apparently not been tested. The State Planning Office has recommended that some kind of state zoning be provided to implement this open space proposal, but no zoning has yet been adopted. Acquisition: State land acquisition for estuarine protection is authorized, apparently through the State Board of Game and Fish Commissioners. State, federal, and private conservation groups reportedly own about 60,000 acres of coastal salt marsh and expect to acquire another 10,000 acres. The remaining 40,000 acres of salt marsh is said to be largely owned by oil and chemical companies. Agency: The Board of Game and Fish Commissioners is responsible for conservation of estuaries, and expresses its views on proposed developments in hearings before the State Water and Air Resources Commission or the State Planning Division. Funding: Funding of State programs for conservation and protection of estuaries in recent years has ranged from $50,000 to $300,000 annually. Court Tests: None. Coordination: The Board of Game and Fish Commissioners, the Water and Air Resources Commission, and the State Planning Division coordinate with one another their respective programs affecting estuaries.

Florida. Regulation: Florida authorizes the designation of a "bulkhead line" along or offshore from tidal lands. Beyond such a bulkhead line no filling or bulkheading is allowed; in one county (Manatee) in addition no dredging is allowed beyond the bulkhead line. Acquisition: The salt marsh in the NASA complex at Cape Kennedy, about 40,000 acres, has been set aside in a National Wildlife Refuge. Agency: Bulkhead lines are fixed by the local city or county governing body, subject to the approval of the Trustees of the Internal Trust Fund (composed of the Governor and six state cabinet officers). A preliminary biological, ecological, and hydrological study is required from the State Board of Conservation. In this connection, the Board of Conservation has issued a circular containing guides for evaluating marine productivity and adopting standards for waterfront development. The Trustees of the Internal Fund have reportedly placed a moratorium on dredging and filling until these studies can be completed.

Georgia. Regulation and Acquisition: Other than the usual fish and game regulations and water pollution controls, Georgia apparently has no current active program for regulation or acquisition of estuarine areas. However, the power to acquire land is vested in the Game and Fish Commission for waterfowl areas and in the state parks agency for public parks. Agency: The State Game and Fish Commission is responsible for wildlife and fishery programs, including marine as well as inland fisheries. The Water Quality Control Board is responsible for water pollution control in estuaries and elsewhere in the State. Funding: No information. Court Tests: None. Coordination: It is reported that the State Planning Bureau and the Coastal Area Planning Commission will probably eventually serve to coordinate conservation and developmental matters.

Louisiana. Regulation: Other than general water pollution control legislation, Louisiana's only regulatory controls protecting estuaries are based on permits issued by the Corps of Engineers or by Louisiana's Mineral Board or Department of Public Works, involving publicly-owned bottoms.

Agency: The permits for projects affecting publicly-owned bottoms are not granted without prior examination and approval of the Wild Life and Fisheries Commission. Funding: Total state program spending for estuarine research, management and development is about $1 million annually. Court Tests: Only legal tests have apparently involved state ownership of bottoms, not validity of regulatory legislation. State control of bottoms has reportedly been upheld except in rare cases involving Spanish land grants. Coordination: Conservation activities of Wild Life and Fisheries Commission are coordinated with Corps of Engineers, USGS, Fish and Wildlife Service, and State Mineral Board, Department of Conservation and Board of Health.

Maine. Regulation: Other than general water pollution control and pesticide control legislation, Maine's principal regulatory controls for estuarine protection involve: (1) a 1967 coastal wetlands alteration permit law, and (2) Corps of Engineers permits for alteration of coastal wetlands. The 1967 wetland control law prohibits filling, removing, dredging or draining of sanitary sewage into wetlands bordering coastal waters, without a permit from the municipality (or county) affected, issued with the approval of the Wetlands Control Board. Approval may be withheld if the proposal threatens public health, safety or welfare, would adversely affect abutting owners, or would damage conservation of water supplies or wildlife or fisheries. Acquisition: Both the Inland Fisheries and Game Department, and the State Park Commission have current coastal land acquisition programs. The U. S. Bureau of Sports Fisheries and Wildlife is acquiring about 4,000 acres of salt marsh as National Wildlife Refuge Areas. Agency: The Wetlands Control Board consists of the Commissioner of Sea and Shore Fisheries, the Commissioner of Inland Fisheries and Game, the Forest Commissioner, the Chairman of the Highway Commission, and the Chairman of the Water Improvement Commission. The Department of Sea and Shore Fisheries has general responsibility for coastal fisheries. Land acquisition is a function of the Inland Fisheries and Game Department (for waterfowl) and the State Park Commission for recreational park purposes. Funding: Wetland acquisition for waterfowl purposes is proceeding at about $20,000 annually. Twenty-two miles of waterfront valued at $3 million are owned by the State Park Commission, and another $2 million in bond issues is pending. Court Test: The wetland acquisition program has apparently been sustained in court. Coordination of Regulation and Development: Some coordination may be achieved by the Interdepartmental Task Force or Water and Related Land Resources.

Maryland. Regulation: Other than general water pollution control legislation and local zoning controls, the protection of estuaries in Maryland is apparently provided through controls over state-owned lands. Acquisition: Lands bordering estuaries are acquired by the Department of Game and Inland Fish, and the Department of Forests and Parks (both under a Board of Natural Resources).

Agency: Controls over state-owned lands are delegated to the Board of Public Works on recommendations of the Department of Chesapeake Bay Affairs, the Department of Water Resources, the Department of Game and Inland Fish, and the Department of Forests and Parks. Acquisition is by the Department of Game and Inland Fish, or the Department of Forests and Parks. Planning: An extensive planning study of all wetlands, including estuaries, is underway. Court Tests: The State's control over taking of sand and gravel from the Potomac has been sustained in court. Coordination: Coordination of conservation, development and navigation is by the Board of Natural Resources, meeting with the Director of Economic Development and Planning Department representatives.

Massachusetts. Regulation: Other than water pollution control legislation, Massachusetts' principal regulatory controls for estuaries consist of: (1) a statute prohibiting the removing, filling or dredging of any bank, flat, marsh, meadow, or swamp bordering on coastal waters, without specified local and state permission or restrictions; and (2) a related statute authorizing a "rule-making" approach, under which the Commissioner of Natural Resources with the approval of the Board of Natural Resources may adopt regulations concerning alteration or pollution of coastal wetlands; if these regulations are found in court to constitute a "taking" of property, the Department may proceed to condemn the land in fee or lesser interest by eminent domain. This legislation was enacted after extensive studies and reports. The Department of Natural Resources regards the rule-making authority as the more promising approach. It permits the Department to move on a regional basis to preserve wetlands without waiting for actual development commitments. Under this law, for example, the Department recently established a wetlands protective area covering 35,000 acres in one town. Agency: The Department of Natural Resources administers the program through several of its divisions. Program Goals: Program goals being carried out through a series of estuarine studies, are to maintain the estuaries in as near as possible to present conditions consistent with management programs. Funding: Estuarine research is currently supported at about $120,000. Court Tests: The Massachusetts wetlands permit legislation has been sustained in lower court tests, but the rule-making authority has apparently not yet been litigated. Coordination: The conservation efforts are coordinated by the Department of Natural Resources with the State Department of Public Works, and Division of Water Pollution Control, and the U. S. Corps of Engineers, Bureau of Commercial Fisheries and Bureau of Sports Fisheries.

Mississippi. Regulation and Acquisition. Mississippi apparently has no current program for regulation or acquisition of estuarine areas other than through participation in Corps of Engineers navigation permit proceedings. Agency: The Gulf Coast Research Laboratory is responsbile for research, and the Mississippi Marine Conservation Commission for leasing of offshore bottoms and other estuarine conservation. Funding: The annual expenditures of the above two agencies is about $500,000 -- over 75% for research. Court Tests: None. Problems: Only problems noted resulting from development are spoil deposits.

New Hampshire. Regulation: New Hampshire adopted in 1967 a statute prohibiting the removal, excavation, filling, or dredging of any bank, flat, marsh, or swamp in and adjacent to tidal waters without the approval of the New Hampshire Port Authority. Conditions to protect fish and game may be prescribed by the State Fish and Game Department, and installation of bulkheads or other structures may be prescribed by the Port Authority. Two other 1967 laws prohibit dredging any marsh or swamp lying below the Mean High Water level of any public waters, or filling below Mean High Water level of public waters, without approval by the Governor and Council. Acquisition: Tidal marshes are being acquired by the State Fish and Game Department in small installments, by gifts or as funds become available. Progress has been slow, but the Department, in cooperation with private groups, is now seeking to raise funds to acquire one 4,500 acre marsh. It is thought that condemnation powers may be required to clear some titles. Agency: The Port Authority is vested with principal regulatory authority under the tidal lands control law. The Fish and Game Department is generally responsible for fish and wildlife conservation, including marine fisheries and has estuarine land acquisition authority. Funding: Estuarine land acquisition is currently hampered by lack of state funds, procedures and personnel, but federal aid is available for acquisition. Court Tests: None.

New Jersey. Although detailed information has not yet been obtained from New Jersey state agencies concerning estuarine acquisition and regulation programs, a large-scale estuarine acquisition effort is known to be underway in New Jersey. Passage of a $60 million Green Acres bond issue in 1964 has reportedly resulted in acquisition of about 20,000 acres of salt marsh by the Division of Fish and Game, and another 50,000 acres are being acquired. Previously, the Division had acquired about 30,000 acres. The U. S. Bureau of Sports Fisheries expects to control over 50,000 acres when its acquisition plans are completed. Upon completion of all of these programs, about 90% of the high value coastal salt marsh of New Jersey will be protected.

New York. Regulation and Acquisition: Other than the usual fish and game laws, water pollution controls, and restrictions upon the grant or lease of State lands, New York exercises no regulatory controls in estuarine areas. New York, however, does have a multi-faceted program for public land acquisition and for conservation of lands in public ownership.

Under the Park and Recreation Land Acquisition Bond Act of 1960, the State Conservation Department was authorized to purchase wetlands throughout the State, and did in fact acquire one tract of nearly 200 acres of tidal marsh. Under the Fish and Game Law, the State may purchase land from any source, and under the Conservation Law, the Water Resources Commission may take land by eminent domain.

The Long Island Wetlands Act permits the State Government to enter cooperative agreements with the towns and counties on Long Island in support of conservation of tidal marshes. Where wetlands owned by towns or counties have been dedicated to conservation purposes, costs of maintenance and operations are shared by the State on a 50-50 basis with the local government. Cooperative agreements may also provide for development of dedicated wetlands by the State Conservation Department with its own personnel. 15,500 acres of wetlands are now under cooperative agreements with the townships. Program goals are to extend the agreements to about 31,000 acres of remaining township lands, which constitute the bulk of significant Long Island wetlands. Agency: The State Conservation Department is primarily responsible for estuarine conservation programs. Condemnation powers are vested in the Water Resources Commission. Funding: Average annual State expenditures under the Long Island Wetlands Act are projected at about $15,000. Court Tests: None. Coordination of Regulation and Development: The Water Resources Commission is responsible for coordination of all activities centered on water.

Oregon. (1) Oregon is now engaged in an inventory and planning study of estuarine conservation under the Clean Waters Restoration Act from which answers are expected within a year. From this study, areas of conflict are expected to be defined and a single responsible agency to be designated.

(2) Present controls apparently involve only the usual water pollution control regulation, fisheries management, and public land controls.

Rhode Island. Regulation: Rhode Island in 1967 adopted an "Intertidal Salt Marsh Law," which prohibits disturbing the ecology of intertidal salt marshes by dumping or excavating the marshes, without a permit from the Department of Natural Resources. Current policy more or less prohibits any filling. Several applications to fill have been turned down, at least two dumps shut down and a number of activities stopped. Acquisition: The State Natural Resources Department has made limited acquisitions of salt marshes and has planned a more extensive program when more funds are available. The Department does not have condemnation powers. Agency: The entire Rhode Island state program is carried on within the various divisions of the State Department of Natural Resources. (Divisions of Harbors and Rivers, Conservation, Planning and Development, and Law). Funding: Limited funds have been made available periodically for salt marsh acquisition. The operating programs are carried on as part of the activities of existing divisions of the Department of Natural Resources without specific budgeting. Court Tests: No test of the Intertidal Salt Marsh Law has been made beyond the lower courts. Coordination of Regulation and Development: All coordination is apparently carried on internally within the relevant divisions of the Department of Natural Resources. Permits are issued by the Division of Harbors and Rivers, inspections made by the Division of Conservation, and enforcement is conducted by the Division of Enforcement. When necessary, the Division of Planning and Development reviews applications.

South Carolina. Regulation and Acquisition: Other than the usual fish and game laws, water pollution controls, and procedures for the grant or lease of State lands, South Carolina has no regulatory controls in estuarine areas. No active estuarine acquisition program is now underway, but the Wildlife Resources Department has acquired several large salt marsh areas for waterfowl hunting. About 30,000 acres of salt marsh are included in the Cape Romaine National Wildlife Refuge. An estuarine study program is being initiated at about the time this publication is issued. Agency: The South Carolina Wildlife Resources Department, including its Commercial Fisheries Division, appears to be the state agency with the principal current program interest affecting estuaries. The estuarine studies recently initiated are under the Water Resources Committee. Funding: No information available. Court Tests: As this publication goes to press, a test case is in progress before the State Supreme Court to determine if the State owns (as it claims) to the Mean High Water line, or only to the Mean Low Water line -- i.e., whether the State owns its "tidelands." Coordination of Regulation and Development: The principal agencies that would be listed at this writing as being likely to be involved in arrangements for coordinating estuarine regulation and development are the Division of Commercial Fisheries of the Department of Wildlife Resources, the Division of General Services of the Budget and Control Board, and the State Attorney General.

Texas. Regulation: Other than the usual water pollution control legislation, Texas' only regulatory controls over estuaries involve: (1) establishment of bulkhead lines over submerged state lands, beyond which leases may not be made; and (2) authority to regulate disturbance of bay bottoms that might affect fish or shellfish nursery areas. Program Goals: To protect nursery areas, oyster reefs, and fish producing waters; permit system to regulate disturbance of bay bottoms now being designed. Agency: The Texas Parks and Wildlife Department is responsible for protection of bay bottoms. The Submerged Land Committee (composed of Director of Parks and Wildlife Department, two university marine science officials and two Governor's appointees) advises the School Land Board on leases and bulkhead lines. Court Tests: Bay bottoms regulation has been confirmed by Attorney General. Funding: The Department expects to have one full-time professional employee.

Virginia. No detailed information was obtained from Virginia state agencies concerning estuarine programs. It is reported that the Commission of Game and Inland Fisheries, the Commission of Fisheries, the Water Control Board and the Division of Water Resources all have administrative responsibilities relating to estuarine resources. It is also reported that the Commission of Game and Inland Fisheries has acquired several large areas of coastal marsh and expects to acquire more; that the State Parks Commission also has acquired some salt marsh; and that a feasibility study for further acquisitions is contemplated.

Washington. No detailed information was obtained from Washington state agencies concerning estuarine acquisition and regulation programs. The Department of Natural Resources controls ownership, disposal and leasing of tidal and subtidal lands. The Department of Fisheries is responsible for the state's $6.5 million annual program of fisheries management and research, including shellfish and food fish.

APPENDIX III

JURISDICTIONAL CONSIDERATIONS IN ADMINISTERING A COMPREHENSIVE ESTUARINE PROGRAM

A case could be made for placing the responsibility for management of the State's estuarine areas program in any one of several agencies, following the principle of using an existing agency rather than creating a new one. This principle is in line with the general trend in State governments towards consolidation and away from proliferation.

The Department of Conservation and Development would be suitable because it has responsibilities and authorities on both sides of the basic question in the estuarine area program; i.e. preservation of natural values vs. commercial, residential, industrial, or other development. C & D also has field agencies which will be active in the program regardless of the agency which is assigned primary responsibility for it, and it has a governing Board in being.

Under its present organization, however, the Department of C & D has no Division to which this program could logically be assigned without bias toward either conservation or development, nor is it engaged in any similar programs at the departmental level.

The Department of Water and Air Resources has responsibility for water quality and navigation functions, which are among those that will be prominent in the program. It also has currently a responsibility for determining a coordinated State position on applications for Army Engineer Permits for proposed modifications in navigable waters, which gives it a process in being that will be applicable in determinations that will have to be made as the program for preservation or development of estuarine progresses. This Department operates under a Board which would be capable of making necessary decisions, and also under an Advisory Council.

Although several programs in the Department of Water and Air Resources are related to the estuarine program, that Department is more closely associated with water problems per se, rather than that in peripheral land use.

The Department of Administration, through its Property Control Officer, already has major responsibilities for exactly the kinds of lands which are the core of the problem -- those below the high water mark - and it has the capability for acquiring other lands in the estuarine areas which may be desired as a part of the program. It has statutory powers for land acquisition, and a close working relationship with the Attorney General's office, the Council of State, and the Governor for obtaining needed approval of lands for public purposes.

Although the Department of Administration is not now engaged in comprehensive programs of land use planning and administration such as the one proposed here, present activities of its Property Control Division, among existing state agencies, most closely approach these functions.

The Committee recommends that responsibility for the estuarine program be placed in the Department of Administration. The magnitude of the land management aspect of the problem, plus the fact that the Department of Administration is organizationally in the best position to take on the functions, led to this conclusion. It will be necessary to add some staff, and it was agreed that an employee whose qualifications would fit him for the role of a conservation planner should have the dominant position among those assigned specifically to the estuarine areas program with a grade sufficiently high to attract outstanding applicants for the position. Both this position and that of the Community Planner will be primarily planners, with detailed support as needed from the specialists in other agencies, to prevent duplication of effort. They will develop a "program focus" upon which specific acquisitions for the preservation of natural values, or the issuance of permits for development, will be based.

NEEDS FOR ESTUARINE AND POLLUTION STUDIES IN THE UPPER SOUND OF THE STATE OF NORTH CAROLINA AND ESPECIALLY AREAS OF DARE COUNTY.

Dare County is the most easterly of the North Carolina counties. It is surrounded on the east by the Atlantic Ocean, on the south by Pamlico Sound, on the north by the Albemarle and Currituck Sounds and the west by Tyrrell County and the mainland. Back at the turn of the Seventeenth Century watermen settled on the sound washed beaches of Roanoke Island and their livelihood was primarily derived from commercial fishing. Also there was a small amount of stock raising; and in the past fifteen years the principal source of income has been the tourist industry with a gradual declining commercial fisheries.

The commercial fisherie was primarily concerned with shell fishing, and shad fishing and when it was at its height, Dare County, and especially Stumpy Point was known as the Shad Capital of the world. Over the many years we have seen a gradual decline of the fleets of the sound due to many speculative factors and many factors that are unknown at this time due to inadequate scientific studies.

Dare County is vitally concerned with any estuarine studies and speculations that are to be made in the future in as much as our great attraction is the water and our livelihood comes from the water, be it the tourist industry or commercial fishing. Dare County at present is relatively free from pollution and destruction of marsh land, and it is this very innocence of the area which we wish to preserve by competent planning based on extensive investigation.

In 1965, Dare County had a basic income of sixteen million, two hundred sixty two thousand dollars. 10.5% or one million, seven hundred thousand dollars was contributed by the commercial fishing industry, and 57.5% or nine million, one hundred fifty five thousand dollars was contributed by the tourist industry. This figure is quoted to demostrate the interest of Dare County in programs that may effect our estuarine bodies or our ocean coastline.

Of additional concern to Dare County is its timber industry which is self perpetuating industry that will provide income and jobs for people in the future and has a definite stake in the estuarine areas of Dare County.

Dare County in the past years had advocated several studies that they felt should be instituted by the proper and qualified agencies and have communicated with the Department of Water Resources, Division of Stream Sanitation in the past relative to the ideas some of which will be put forth below.

These ideas are offered as suggestions and thoughts that have been raised by the populace of Dare County concerning its most important asset, the water.

It has been experienced, over the past fifteen years, that when estuarine talks and estuarine conferences were held that no one has any definite concrete evidence to substantiate proposed thoughts and theories to preserve the sounds and estuaries and no base line have ever been established.

It is the contingent of Dare County that before any bills, any theories advanced or revalutionary moves made that a definite base line be established so that the direction pursued will be of benefit and not a determent to the County and people involved.

It is also our feeling and we emphasize this, that these studies must be made now, while it is still early enough to use their findings. If these studies are delayed which is almost always the case, then Dare County will suffer as other areas have from development carried out with little planning and investigation.

Parts of the following have been done in segmented areas and are available, some that follows has not been done and would be beneficial in any statement or conclusions made relative to the sounds and even the nearer ocean.

I. NATURAL FACTORS:

A. Solar Radiation: Number of days of sunshine can be determine from past weather bureau document.

B. Air Temperature: Temperature of the air can be documented through the weather bureau.

C. Precipitation: Rainfall is a very vital factor from the stand point of changing pH and salinity and its effects on various runoff and river flow.

D. Influence of Tides, particularly on water temperature, salinity and pH. Inlets are of vital concern and should offer an area of more definite study as to the value of inlets, especially the vertical movement of the tides versus the horizontal movements of the tides as well as its effects on temperature and changes in acid-base balance. The tide of course, brings in nutrient material as well as carries to sea undesirable materials. It cannot be stressed enough how important a study of this type might be on the effect of pollution. By studying flushing phenomena we can learn how much pollution can be tolerated, that is how much can be naturally dissipated.

E. Inlet Effects: Inlet effects somewhat dovetail in all studies which points out the need for the inlets, and maintenance of the integrity of the inlets, that are in existance and those cut from time to time during storms.

Historically inlets should be considered outlets because it has been shown by surveys in the past that a great majority of inlets that are cut along the Outer Banks were actually outlets made by the turning of the eye of a hurricane forcing a surge wave against the Outer Banks from the sound to the ocean opening up new inlets. The original "John White" map of the 1580's shows several inlets along the Outer Banks which are not in existance today. In northeastern North Carolina there is only one inlet between Hatteras and the Virginia - North Carolina, a three hundred mile distance. This one inlet, Oregon Inlet, has to carry the flow of the upper Albemarle Sound and the upper Pamlico Sound into the ocean and this includes the flow from the Chowan River complex, Perquimans River and the Pasquotank River, as well as all of the Roanoke River Basins. Inlet effects are important hydrographic factors indirectly effecting temperature of inshore and estuarine waters. As a result of the tide, the water undergoes considerable vertical and horizontal movement, thereby coming into contact with tidal traps in estuarine areas which greatly increases the effect of climatological conditions on its temperature and general ecology.

The flow through inlets should be studied to determine their influence in the estuarine areas. For example, it should be determined what effect the stabilization of inlets such as Oregon Inlet, has on these estuaries. Possibly subsidiary inlets may have a beneficial effect.

The water temperature if measured should show marked variation according to the range of the tide at the time of high water in relation to the time of day. Besides what has been discussed before, solar radiation and air temperature the magnitude of the hourly and daily variations in temperature should be corrolated, the range of the tide, pH and salinity.

The sediment studies should be made to demostrate its effects upon the geological and biological aspects of the sound and the rivers. Corrolations between spring tides and neap tides relative to sediment. It has been determined in studies elsewhere that as a ocean tide enters a partially enclosed basin along the coast it produces considerable variation in the physical conditions existing there, such as salinity, temperature, pH concentration and etc.; hydrography of the region and the range of the tide determine largely the extent of variation that is produced. From a biological and geological standpoint these are intimately related features of tidal movements and are of considerable importance and are interrelated to our next subject, river effects.

As has been proposed in the past by many Outer Bankers, low level washes should be left across artificial dune barriars to permit the flow of water either from the ocean to nourish the sounds, as has been proven by nature to be beneficial and to relieve the sounds, away from areas of congestion and large concentration of houses and people in the event of disasterous hurricanes. This would provide a safety factor for the Outer Banks and the mainland which would prvent undue flooding of the estuarine areas in times of hurricanes. Flow studies should be made to indicate a major tidal range by use of drift bottles which would pinpoint the areas receiving the greatest tidal effect of the inlets.

F. River Effects: As stated above there are many rivers that enter into the upper Albemarle area and in lower Pamlico Sound there is the Pamlico Tar River system and in the Southern most portion is the mouth of the Neuse and Trent Rivers emptying into the lower sound.

heading bringing to mind the effect of this discharged water from man made dams along the rivers. Efforts should be made to co-ordinate unusal releases of fresh water from dams so as not to distrub the many complexes that exists in estuaries. Unusal bores of fresh water can have an extremely adverse effect on a delicate balance that is maintained in estuarine areas.

II. MAN MADE EFFECTS:

A. Municipal Effects: Discussed above under River Effects.

B. Agricultural Effects: The above has been discussed under River Effects.

C. Land Development: Muchhas been written in the press relative to land filling and land development and its effects on the estuarine areas of various states and it might be added some of this was done haphazardously without thought except for the development of substandard vacation areas. Nevertheless, a certain amount of land fill and its associated development is necessary for the economic and rormal growth of an area and should be considered upon the economic stand point, and should not be Con-condemed in totality.

The following studies should be made before land fills are utilized by land developers. A joint effort between the wildlife agency, those concerned with marine life and those concerned with the general ecological conditions be consulted as to the value of the so called "commercial development" versus so called "destruction" of estuarine areas so that orderly beneficial economic development will not be hindered.

There are many estuarine areas that are unsuitable for maintenance of worthwhile vegetation, wildlife, or marine life and no harm could follow utilization of these estuarine areas for recreation, land development, or for industry.

Development from an economic stand point should not be severely crippled by preservation of undesirable lands in their so called natural state.

D. Industrial: Much has been said about mining in the past year in some of our estuarine areas. It is known that there are inumerable shell deposits which could be mined economically in Pamlico Sound, Albemarle Sound, and Croatan Sound. A reacessment of the features relating to mining in these areas should be made so that a possible benefit to the deprived areas of North Carolina might be realized. It has been suggested that sediment studies, which have raised the greatest question, be made in the areas of the shell beds, as to the beneficial verses the adverse effects on fishing.

Efforts have been made by the Division of Commercial Fisheries in the North Carolina Department of Concervation and Development to establish the most realistic and economical means of harvesting fish from the sounds and the means that are the least ~~constructive~~ destructive for harvesting of this crop. To wit, the three hundred pound crab dredge and oyster dredge has been abolished, the purse siene abolished.

Agreements amongest the fishermen have been made to drag for crabs and shrimp at times designated by scientific study to be economically at their peak.

We have seen a disasterous decline in our oyster and clam industry due to estuarine changes that have no reason, from the small amount of research that has been done thus far.

As has been estimated there is an average flow of approximately fifteen billion gallons of water each day into the Pamlico Sound and from there through the openings of the Outer Banks into the sea.

1. The temperature of this fresh water is usually warmer than that of the bays and of course is effected by solar radiation, air temperature and participation. A study of relationship is needed. Temperature changes in rivers caused by industrial outlet should also be carefully studied as to their effects on the estuaries and their marine life. In addition, fresh water causes a change in estuarine or bay waters.

2. Also, p^H changes can be brought about by industrial waste where the waste products have either a high concentration of OH^- ions or H ions. These effects on the life of estuaries cannot be overlooked.

3. Sediment, we know of shoaling in the mouth of all rivers and the sediment which is carried down from the mountains of North Carolina. Not only do we have the North Carolina Mountains, but in the case of the upper Albemarle Sound, the Virginia Area.

4. Agricultural runoff carries herbicides, pesticides as well as fertilizers and material assoicated with agriculture.

Efforts should be made to determine the types of poisons as well as fertilizers being used in these particular areas and determination of there effects upon the natural ecology of the area. It also should be determined if fertilizers and pesticides are of the decomposible type when mixed with water. Further investigation could pinpoint the tolerance of the rivers and streams for the decomposition of these substances. If it is found that decomposition does not occur, alternate pesticides and fertilizers should be promoted.

5. Industrial Runoff: A determination and actual count of the industrial plants discharging into the various rivers flowing into the estuarine bodies should be made and classified as the type of runoff whether a chemical, thermal, etc. and efforts made to encourage industry to cooperate whole heartedly in aiding and protecting our estuarine bodies. One type of waste which is especially dangerous to aquatic life is nitrogen rich material, which will cause the rapid over population of certain species. The over population in turn can cause extinction of the prey of the over populated species.

Suggestions offered may be in the form of tax exemption of building of cofrer dams, arresting basins, areation plants and etc.

6. Municipal Runoff: No doubt the Department of Air and Water Resources of the State of North Carolina can pinpoint the municipalities and settlements which are discharging the municipal waste untreated directly into the rivers of our State. There are ways and money available for rectifying this situation and it is believed that city governments are quite aware of the situation that exists and are more than willing to cooperate in reducing the municipal flow and in treating their municipal discharge. None the less, a classification and publication of municipalities without treatment plants should be published and cities awarded grants in a systematic manner depending upon the flow and type of affluent rather than upon political expediency.

7. Fresh Water Flow: Fresh water flow is placed under this

Channel dredging has raised a question as to its effect on shell beds and fishing in general. The effects of dredging should be easily determined by studying the existing channels that have had maintenance dredging yearly and new channels that have recently been dredged as commerce spreads. It would be interesting to study the effects of the proposed James River channel in Virginia from Chesapeake Bay to Richmond, its effects upon the current oyster fisheries and fin fisheries. Also, it would be of interest to study the effects of the Houston Channel relative to changes from there to the Gulf of Mexico. All of these may give us some index as what might be expected in estuarine changes along our coast. Again, the economic benefits must be wieghed and should not be blocked if a commercial channel benefits the enviroment for the betterment of the whole ecological condition. On the favorable side of the balance, new channels may aid the discharge of undesirable polluants into the sound and ultimately the Atlantic Ocean for degradation and dilution.

Mosquito Control Drainage and Land Drainage. Dare County in its mosquito control program has cooperated closely with the Fish and Wildlife prior to institution of any mosquito control drainage. Studies were made to determine the effect on game, grasses, marine life such as fin fish, shell fish and flora as well as water fowl. Drainage has been conducted in areas which show the highest mosquito bloom and breeding with great concern for all the factors mentioned above. No area has been drained that would adversely affect one of our most out standing attractions, water fowl. It is suggested that a co-operative program between the mosquito control representatives and the wildlife and marine biology facilities be instituted in long range planning for drainage for mosquito control.

By the same token the above could apply to drainage for forestry, agricultural, and general land use and development programs. A workable outline of procedure could be developed so that changes would not have an adverse effect upon the general environmental conditions.

III. CONTROL INLETS: Over the past twenty-five years the subject of controlled inlets has occurred; particularly as a means of nourishing the upper sounds in changing more or less dorment stagnant areas into areas of thriving marine activity and to return the areas to the environmental situation that existed one hundred years or so ago when seven to eight inlets were opened from the Virginia line to the Core Banks.

It would be interesting to observe an experiment now being conducted by the City of Cheseapeake Virginia in its nourishment program of Back Bay. The proponents of this program advocates an optimum salinity and pH for Back Bay to rid the bay of obnoxious aquatic life specifically certain type of aquatic grasses which prevent growth of desirable grasses that attract water fowl. Additionally, proponents feel that new marine life such as crabs and rock fish will be of an untold economic benefit to the area. It is their hope to change an undesirable partially unproductive body of water into a vigorous productive area.

Those who support the idea of controlled inlets along the Outer Banks do so for many reasons. The first reason presented is that due to dune stabilization programs. What has been in the past recognize as the highest points on the Outer Banks, and where the communities are situated, have now become low points on the Outer Banks and will be the first drowned out in the next hurricane with preservation of the vacant land. These people advocate low level washes that will guide storm tides away from the populated areas and relieve sound pressures. A second proposal offered is that an increase in salinity will cause a settling of the suspended sediment found in fresh water areas. Local sound fishermen have noted for years that when the water becomes more brackish or there is an increase in salinity, water clears and is more productive. A third reason for a control inlet it could be used for a pumping station type of operation or an actual inlet with a control gate would be to relieve the sounds of polluted water and permit revitalized new ocean water into the sounds. This would return estuarine bodies of water again to the fast production of shell fish as well as providing in ecological atmosphere for a fin fish nursery . These views were expressed after the 1962 storm which opened an inlet just north of Buxton Villege on Hatteras Island which produced a new vitality for the fisheries industry both tourist fishing and commercial fishing. A new growth of shell fish which includes oyster, clams and shrimp in areas where they had long since disappeared.

SUMMARY

These thoughts concerning the estuarine areas expressed by the people of Dare County are broadly presented, not as a vague idea of what we would like done, but as a plea for what we feel must be done if we are to have a successful growth of industry, agriculture, and commerce, without sacrificing our natural resources which in turn propagate our fishing and tourist industries. We do not wish to have our natural resources destroyed as has has happened in so many areas to the north and south of us. We wish to enjoy the benefits of development without these accompanying evils which come with poor planning. We have tried to present a superficial guideline to be followed. No doubt areas of investigation not mentioned also deserve investigation.

Presented at the Estuarine and Pollution Conference

New Bern, North Carolina on July 26, 1968

By the Dare County Board of Commissioners

WWHarvey Jr.

Prepared by W. W. Harvey, Jr. B.S., M.D., F.A.C.S., Commissioner

W. Stanford White.

W. Stanford White, Chairman of Dare County Board of Commissioners

Archie Burrus

Archie Burrus Member of the North Carolina House of Representatives

PROCEEDINGS

OF

THE INTER-AGENCY COUNCIL

ON

NATURAL RESOURCES

November 21, 1967

305 Administration Building
Raleigh, North Carolina

Meeting of
The Inter-Agency Council on Natural Resources
Tuesday, November 21
10:00 a.m. to 12:30 p.m.
305 Administration Building

The purpose of this meeting is to discuss problems relating to the public use of North Carolina's estuaries, and to explore means of more efficiently managing these resources. A tentative atenda is given below:

INTRODUCTION

10:00 - 10:05	Introductory Comments - Mr. Dan E. Stewart, Department of Conservation and Development
10:05 - 10:15	General Description of North Carolina Estuarine Systems - Dr. David A. Adams
10:15 - 10:30	What Good are Estuaries? Fisheries - Mr. J. T. Brown, Division of Commercial and Sports Fisheries, Department of Conservation and Development
10:30 - 10:40	Wildlife - Mr. Stuart Critcher, Division of Game, Wildlife Resources Commission
10:40 - 10:50	Navigation and Public Works - Col. R. J. B. Page, Division of Navigable Waters, Department of Water and Air Resources
10:50 - 11:05	Real Estate Development - Mr. J. R. Hinkley, Division of Community Planning, Department of Conservation & Development
11:05 - 11:15	Coffee Break

CURRENT PROBLEMS IN MANAGEMENT FOR PUBLIC USE

11:15 - 11:30	Legal and Organizational Problems - Mr. Frank Matlock, Attorney General's Office
11:30 - 11:45	What's Happening to the State's Estuaries? - Mr. George Burdick, Wildlife Resources Commission

SUMMARY

11:45 - 12:00	Possible Course of Action - Dr. David A. Adams
12:00 - 12:30	Discussion

NORTH CAROLINA'S ESTUARINE SYSTEMS

Estuaries and estuarine systems have been described variously by various authors, based on salinity, hydrography, geology, and other factors, but no two definitions coincide. Nevertheless, some general attributes pertain to estuaries. They are coastal bodies of water, connected to the sea by inlets or river mouths, are not quite as salty as the open ocean (with some few exceptions) and may be quite fresh. Estuaries in our area are broad and shallow, but the deep and steepsided fiords of northern latitudes may also be characterized as estuaries. Rather than dwell on characteristics of estuaries and estuarine systems, I think it will be more profitable to go into a description of North Carolina's estuarine systems, for estuaries usually end up to be what the speaker wants them to be.

Among the fifty states, North Carolina ranks third in the acreage of its estuaries. We have more than 2 million acres of estuarine waters, and are exceeded only by Alaska and Louisiana. The 7 major sounds contain about 1.6 million acres, as follows:

Table 1. Acreages of Major Sounds

Currituck	102,400
Albemarle	320,000
Croatan	22,400
Roanoke	16,000
Pamlico	1,088,000
Core	76,800
Bogue	22,400
Total	1,648,000

In addition to the major sounds, a string of minor sounds (Stump, Middle, Masonboro, Topsail, Myrtle, etc.) extend to the South Carolina border. Our northern sounds (Currituck, Albemarle) are essentially fresh, while the southernmost are almost ocean salinity. In between, the other systems run the complete gamut from fresh to salt.

An estuarine system consists of more than the main water mass, however. Peripheral marsh land and tributary streams are major contributants to the system, and will constitute most of the subject matter under discussion today.

Coastal marshes form in protected areas behind the barrier dunes and on the edges of the sounds where the substratum is regularly waterlogged. The waters flooding these marshes may be saline, brackish, or almost fresh and the flooding may occur rhythmically, as a result of tides, or irregularly. North Carolina is perhaps more liberally endowed with coastal wetlands than any other of the eastern states, possessing over 200,000 acres of these valuable lands.

Three major types of coastal marsh occur in North Carolina; regularly-flooded salt marsh, irregularly-flooded salt marsh, and coastal fresh marsh. There are 58,400 acres of Regularly-flooded Salt Marsh, primarily distributed from the South Carolina line to the vicinity of Beaufort (Table 2). More limited stands occur along the Outer Banks north of Oregon Inlet. As their name implies, these marshes are regularly flooded with salt water as a result of the twice-daily rise and fall of the tide. The largest stands of this marsh type, over 8,000 acres, are found behind Smith Island at the mouth of the Cape Fear River. Irregularly-flooded Salt Marsh is the most extensive of the coastal marsh types, covering over 100,000 acres primarily north and east of Beaufort along the Outer Banks and on the inner side of Pamlico Sound in Dare, Hyde, Pamlico, and Carteret counties (Table 2). The water which floods these marshes at irregular intervals, mostly as a result of winds and storms, is generally of lower salinity than that which floods the Regularly-flooded Salt Marshes. Over one-half of the 47,500 acres of Coastal

Table 2. Acreages of salt marsh types by counties

Total SM	County	Regularly flooded SM acres	% of County Total	Irregularly flooded SM acres	% of County Total
18,000	Brunswick	18,000	100	0	0
7,850	New Hanover	7,850	100	0	0
9,100	Pender	9,100	100	0	0
12,350	Onslow	11,350	92	1,000	8
48,600	Carteret	10,000	21	38,600	79
15,000	Pamlico	0	0	15,000	100
450	Beaufort	0	0	450	100
31,500	Hyde	1,600	5	29,900	95
16,000	Dare	500	30	15,500	97
0	Currituck	0	-	0	-
158,850		38,600		100,450	

Fresh Marsh occur around Currituck Sound and the remainder is in local areas in Beaufort, Brunswick, Camden, Craven, Dare, Hyde, New Hanover, and Tyrrell Counties. Incursions of salt water into these marshes are rare, occurring only as a result of extreme storms. In general, the waters flooding these marshes are fresh to moderately brackish.

Regularly-Flooded Salt Marsh

Most visitors to the southern North Carolina coast are aware of the vast stands of Regularly-flooded Salt Marsh occurring between the narrow barrier beaches and the mainland. The labyrinthine creeks and expanses of green grass, fading to golden yellow in autumn, are a characteristic part of the scenery of our southern coast. Virtually all the marsh in Brunswick, New Hanover, Pender, and Onslow Counties, and 20% of the Carteret county marsh is of this type. The habitat of these marshes is unique. Here tides are the greatest along our coast, averaging between 2 and 5 feet, and rivers bearing heavy sediment loads discharge almost directly into the ocean. These factors combine to produce the deep, soft, silty, gray sediments ("soils") and intricate drainage patterns of these marshes.

By far the most important plant of the Regularly-flooded Salt Marsh is Smooth Cordgrass (Spartina alterniflora Loisel.). It occurs in vast pure stands, from an elevation of approximately mean sea level to about the mean spring high tide line. Smooth Cordgrass along the soft, silty creek banks is tall, averaging 4 to 6 feet high, and diminishes in height away from the creeks to less than a foot in height in the interstream areas. Here, at or near the mean spring high tide line, Glassworth (Salicornia spp.) and Sea Lavender (Limonium spp.) also occur with short Smooth Cordgrass. There appear to be no genetic differences among the forms of Smooth Cordgrass. Rather, the difference in height seems related to internal drainage and salinity, with the tall forms occurring along creeks where drainage is good and salinities are equal to those of the creek water. Height growth of Smooth Cordgrass seems to be retarded, and the growth of Glassworth and Sea Lavender encouraged, by the poor drainage and higher evaporation-induced salinities of the interstream areas. Localized clumps of Black Needlerush (*Juncus roemerianus* Scheele) may occur scattered throughout the higher portions of the Smooth Cordgrass zone or as a narrow fringe between the Smooth Cordgrass and higher ground at the edge of the marsh. Generally, the Black Needlerush is at an elevation near mean spring high tide. The upper portions of tidal creeks reaching into uplands are also dominated by Black Needlerush.

Northward along the North Carolina coast areas of Regularly-flooded Salt Marsh are less extensive. The last large areas of this type are in Carteret County (Table 2) near Beaufort Inlet and along the sound side of Core Banks. Here the marshes are less extensive and the accumulation of sediment is not so great as farther south. In Hyde and Dare Counties Regularly-flooded Salt Marsh occurs only on the sound side of Ocracoke Island and in local areas near Hatteras and Oregon Inlets.

Irregularly-flooded Salt Marsh

Despite the fact that Irregularly-flooded Salt Marshes constitute almost one-half of the total coastal marsh acreage in the State, relatively little is known of their ecology. Large stands of this marsh type occur on Roanoke Island, on the sound side of the Outer Banks down to Cape Hatteras, and on the mainland shore of Pamlico Sound in Hyde and Pamlico Counties. Tides inundate these marshes infrequently, rarely flooding them to a depth of greater than one foot. The substratum is sandier and more firm and the tidal creeks are shorter and less intricately branched than in the Regularly-flooded Salt Marsh.

Black Needlerush is the dominant plant of Irregularly-flooded Salt Marsh. It occurs in vast, pure stands stretching away like a monotonous grey-green sea. Its wiry culms average about 3 feet in height and grow so densely that it is most difficult to push through them. The general elevation of the firm, black, peaty substratum is approximately mean spring high tide. Smooth Cordgrass occasionally occurs in a limited fringe along creek banks within the zone of regular tidal ebb and flow. Marsh elevations around the mouths of tidal creeks in the Black Needlerush zone are often slightly higher than those farther away from open water. This is apparently due to deposition of sediment at the creek mouths by rather common strong in-rushes of tidal water caused by sudden shifts in wind producing wind, or storm tides. Woody plants, such as Sea Oxeye, Groundsel, and Marsh Elder are mixed with Black Needlerush on these higher sites.

Black Needlerush generally surrounds creeks which lead away from the open sounds. At slightly higher elevations, between the needlerush and the Shrub Thicket, lies a zone dominated by Saltmeadow Grass. This may be a rather narrow band or it may be very large, depending on the relative extent of the area lying between mean high tide and upland beyond the effects of tides. This community is well developed in areas where the Banks are low and broad such as on Bodie and Pea Islands. The aspect of the community is that of a meadow with a dense growth of Saltmeadow Grass often collecting in thick mats. Peat forms under these marshes and there may be an accumulation of up to 6 inches of fibrous, brownish peat densely interwoven with the roots and rhizomes of Saltmeadow Grass. The only other plant of common occurrence here is Salt Grass, although Giant Bulrush (*Scirpus robustus* Pursh), Salt Marsh Fleabane (*Pluchea, purpurascens* (Sw.) (DC.) and shrubs may be scattered throughout. These marshes vary considerably in wetness and salinity. During periods of heavy rain in the winter they may be flooded with virtually fresh water while during periods of storm tides they may be flooded with water of salinity nearly equivalent to sea strength. During the spring and early summer, the marshes may become so dry that no standing water can be found.

Fresh Marsh

Surrounding Currituck and Albemarle Sound, and existing as islands within these sounds, are large areas of fresh marsh. Soils are waterlogged and flooded irregularly to over a foot by wind and storm tides, but no lunar tidal effect is apparent. Depending on water levels, vegetation may consist of Black Needlerush, Threesquare (*Scirpus* spp.), Big Cordgrass (*Spartina cynosuroides*), or Cattail (*Typha* spp.). Numerous floating aquatics, valuable as waterfowl food, are found in fresh marsh ponds and in channels among marsh islands. Among the more important of these are Sago Pondweed (*Potomogeton pectinatus*), Muskgrass (*Chara* spp.), and Wideongrass (*Ruppia marina*).

WHAT GOOD ARE ESTUARIES TO FISHERIES?

Now that we have a better understanding of what comprises an estuarine system, of the extent of such systems in North Carolina, and of the fact that this State probably possesses the most extensive and diversified estuarine areas of all the Atlantic Coast states, we are probably wondering just "what good are estuaries," and rightly so.

In discussing their value, I will comment principally upon estuaries as related to fisheries and fishery activities. But first, allow me to emphasize that the coastal lands and waters are an important and beneficial part of our heritage. We look to these areas as sources of recreational fulfillment and also as sources of some of our most nutritious foods. In the future, we will be even more dependent on them than today.

Saltwater sportfishing, although only one of many kinds of recreation dependent upon the estuarine systems, is a growing giant - increasing about four times faster than the population. According to the 1965 National Survey of Fishing and Hunting, USDI Resource Publication 27, the number of saltwater sport fishermen increased 32% between 1960 and 1965. Over half of the saltwater sport fishing in 1965 was done on the Atlantic coast, where nearly 4.2 million such fishermen spent nearly $80 each to fish, and fished nearly 56 million days (averaged approximately $6 per fisherman per day).

According to a survey being conducted within the North Carolina State University Statistics Department, there are now more than 400,000 sportsmen who fish on the North Carolina coast annually. If the Atlantic coast average annual expenditure of nearly $80 each is assumed valid, this activity represents a total expenditure by saltwater sport fishermen alone of around $32 million annually for gas and oil, food and lodging, fishing equipment, baits, charters, and other items associated with fishing.

There are about 5,000 commercial fishermen who also fish on our coast and derive all or a significant part of their families' income from our coastal waters or estuarine systems. To these men and their families, fishing is a way of life, one with long hours, hard work, and many uncertainties; it's a tradition passed along for many generations which, at least so far, is but little marred by a stigma of "something for nothing" or a "minimum hourly wage." In 1965, these men received a dockside value of something like $9.4 million for their catches of finfish and shellfish (N. C. Landings, Annual Summary), Bureau of Commercial Fisheries, C. F. S. 4126, 1965). Many other persons were employed in handling, processing, wholesaling and retailing these catches which, according to some economists, have an ultimate consumer value of a sevenfold turnover, or about $65.8 million.

Many people visit the coastal scene for reasons other than, or in addition to, fishing and hunting which are still associated with the values of estuarine systems, and the numbers are also increasing much faster than the population growth rate. For instance, estimated annual attendance at the Cape Hatteras National Seashore increased from 301,700 in 1956 to 1,133,000 in 1966; visitors at Fort Macon State Park, during the same period, increased from about 358,000 to 599,000.

Thus far in discussing the value of estuaries, I've dwelled only on the more obvious aspects of recreation, food and employment for thousands of persons. It is all well and good that we are deriving so much from the system, but even the most simple-minded of us must stop somewhere and ask a few questions. What makes these estuaries valuable? Will they remain valuable? What can we expect in the future?

The less obvious but striking importance of estuaries is better realized by further examining the commercial catch records of seafood landed in North Carolina. Of the 225,859,000 pounds of fishery products landed in 1965, approximately 219,000,000 or nearly 97% by weight, consisted of species in some way dependent upon estuaries. These same species accounted for $8,031,000, or 85% of the total $9,394,000 dock-side value of the catch. To obtain these figures, I classified each of the 51 different species comprising the total catch as estuarine dependent or non-dependent. Some species live their entire life cycles in the open ocean and are apparently not dependent upon estuaries during any part of their lives. Such species include calico and sea scallops, swordfish, tuna, and king mackerel. Many species which are known to frequent estuaries, but their actual dependence is questionable, such as spanish mackerel, blue fish, whiting, etc., were also placed in the non-dependent group. Other species, however, such as oysters, bay scallops, and white perch, live their entire lives, or nearly so, within the estuaries. Shrimp, menhaden, striped mullet, and summer flounder are spawned in the ocean but require estuarine conditions during at least the first few months of existence. Shad and alewife, or river herring, are spawned far up fresh water streams, and, except for their first few months existence, live their entire lives in the ocean. Still others, such as trout and black drum, spawn in the estuaries and spend over half of their adult lives there - migrating to the ocean waters for short periods during the colder winter months.

Hopefully, having by this time instilled the realization of the importance of estuarine systems, the next logical question is why are they so important? When the average citizen looks out over the vast green marshes surrounding the coastal waters of the southeast, he is likely to regard them as wastelands because he sees no direct use to man. Most fishermen and biologists, however, have long realized that estuaries are very productive, but only recently have we had the data to prove it. As pointed out in 1960 by Dr. Eugene P. Odum, a noted researcher and authority in comparative productivity of many of the major environments of the world, "estuaries are among the most naturally fertile areas of the world." Total productivity of the Georgia estuarine waters which Dr. Odum studied was determined to be approximately 10 tons of dry organic matter per acre per year, or nearly twice that of the world's best agricultural lands, approximately seven times greater than that of continental shelf water, and approximately 20 times greater than open ocean waters.

Total productivity, however, in these various environments should be thought of as a measure of basic fertility or in terms of potential food energy available to organisms. The relationship of total production to "yield to man" is quite different. More human food per acre, of course, is obtained from a wheat field than from the much more fertile estuary because a much larger percentage of the wheat production is eaten by man compared to the small fraction of estuarine production reaching the human link in the food chain. Where fertility is naturally high as in the estuary, the emphasis must shift from production to utilization.

Why are estuaries so fertile? The mixing of waters of different salinities is a sort of "nutrient trap" in which the nutrients are not swept out to sea but move up and down among a host of organisms, water, and bottom sediments. The back-and-forth tidal flow is a favorable factor since food, nutrients, and oxygen are continually supplied and waste products removed automatically. In these shallow water estuarine systems, fertility is primarily the result of biological activity on the bottom rather than in the water itself, especially where the bottom is alternately exposed and covered by tides. Research indicates that about 60% of the estuarine productivity occurs in the vast areas of cord grass marshes (low marsh), about 30% occurs among the mud algae or microscopic plants growing in the surface muds of the intertidal zone, and much of the remaining 10% from the minute floating plants in the water. Relatively little is contributed from upland drainage or from plant communities at higher elevation.

In an estuary, particularly in the marshes and mud flats, there are an amazing number of living organisms and chemicals that support life. The cycle of life and death is extremely complex. Organisms - both plant and animal - die, and in rotting release tiny bits of organic material similar to the fine mulch of old leaves in a flower bed. The rotting also releases nitrates, phosphates, and other chemicals comparable to commercial fertilizers on the farm. Tides and currents spread these nutrients which are utilized by living grasses and a host of microscopic organisms. Other creatures ranging from minute one-celled animals to clams, snails, shrimp, crabs, and fish feed upon them, and they in turn are fed upon by still larger species. Tidal currents sweep some of these nutrients into the sea, thus aiding the fertility of the ocean, and many sea dwellers gather near the inlets to feed upon bait carried out by the tides.

It seems only a few years ago when I fished along many of our North Carolina coastal areas with my father. Now, my father and my two sons fish these same areas with me. The success rate doesn't seem quite as good, even though we have much better equipment and tackle. For me, the fishing is great sport and nearly always terminates in a more tranquil mood than it began; Dad and the boys are at their best on these fishing days. I recently returned with my father to a little creek in the upper coastal plain where he and I once fished away many quiet hours. Where there once was a restful little creek now there are two steep sided banks, a level bottom of mostly dry sand, a little trickle of clear water and no fish. Perhaps some of you may also fish with your children where you and your parents once fished. You may also remember a few choice spots which have changed a little ... Drastically? I often wonder if our children and grandchildren will have a few quiet moments to spend now and then enjoying the naturalness of some isolated stream or of a broad expanse of salt marsh..

Unfortunately, the natural state of balance within an estuary is complex and delicate - not something which man can alter at will with little or no concern for its well-being. Thoughtless destruction of marshes by disposal of dredged materials, sprawling new industries and residential developments, increasing garbage, sewage, and industrial wastes, more and more insecticides and herbicides, silt and drainage run-off continue to alter more estuarine areas and cause additional loss of habitat. Once this natural balance has been shifted or destroyed, it becomes extremely difficult or impossible to restore.

The greatly increased rate of estuarine alterations is a serious threat to resources of coastal regions throughout the nation. Many of these alterations brought about by man, even though detrimental to the natural resources, are essential for a rapidly progressing civilization; others, however, are unnecessary. It is imperative for the economic welfare of the entire world that the more highly productive areas be recognized and properly utilized.

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By: James T. Brown, Chief
Research and Development Section
Division of Commercial & Sports Fisheries
Department of Conservation & Development

THE WILDLIFE VALUES OF NORTH CAROLINA'S ESTUARINE LANDS & WATERS

The estuaries of North Carolina and the wildlife species which inhabit the marsh lands and waters which comprise the estuarine ecosystem are a resource of inestimatable value to the people of our State.

These marsh lands, and their adjacent and biologically inseparable sounds, bays, and rivers, begin at Currituck Sound and extend southward along the coast to the South Carolina State line.

The salt marshes are classified into two nationally recognized types:

(1) Regularly Flooded Salt Marsh
(2) Irregularly Flooded Salt Marsh

Regularly flooded salt marsh exists for the most part from Oregon Inlet to Ocracoke and from Beaufort south to the State line. A 1954 survey indicated that there were 58,400 acres of this marsh type. Commonly referred to as low salt marsh, these areas are subject to daily flooding by lunar tides. The plant species which characterize the low marsh are: salt marsh cordgrass, needlerush, saltgrass, saltmeadow cordgrass, and glasswort.

Irregularly flooded salt marsh, totalling 100,450 acres, comprises nearly one-half of North Carolina's total of 206,350 acres of both fresh and salt marshes. Major expanses of irregularly flooded salt marsh occur along the western shore of Pamlico Sound from Roanoke Island south to Atlantic, however, smaller expanses are found along most of the estuarine waters of the State. This type is commonly referred to as high marsh. It is subject to less frequent flooding, and the high tides that cover these marshes are usually the result of wind. Vegetative cover is characterized by needlerush, sawgrass, saltmeadow cordgrass, saltgrass, and threesquare.

The salt regime of the marsh land environment has a limiting effect upon the kinds of both the plants and animals which are able to survive these conditions. There is, however, a diversity of animal life present and some species occur in great numbers. A listing of the characteristic species which occur, not necessarily in order of importance or abundance, would include: raccoon, opossum, mink, otter, muskrat, rabbit, nutria, meadow mouse, black duck, clapper rail, sora, marsh hawk, red-winged blackbird, and marsh wren; several sparrows, herons, egrets, owls, and shorebirds; diamondback terrapin, fiddler crab, marsh crab, periwinkle, and marsh snail.

Density data that would reflect population levels are difficult to obtain, however, a recently completed study of the clapper rail or marsh hen in South Carolina, indicates that the 153,000 acres of salt marsh in Beaufort County, South Carolina, support an average of approximately one rail per two acres. The highest population densities exceeded 5.0 rails per acre. These marshes are comparable to those found in the vicinity of Beaufort and Southport, North Carolina. It is in these marshes that the North Carolina public enjoys the unique sport of marsh hen hunting.

Population density estimates for the resident furbearers are not available. We do know that great numbers of pelts of mink, otter, raccoon, and opossum are harvested from these marshes, and that these pelts contributed heavily to the 1965-66 harvest of raw pelts which was estimated to be worth $422,773. Excellent estimates are available for waterfowl populations and hunter-use on Currituck Sound and on several impounded salt marshes which are managed by the North Carolina Wildlife Resources Commission for public waterfowl hunting.

On Currituck Sound, during the 16-year period 1951-1966, the combined population of ducks, geese, and coots averaged 127,000 birds. These waterfowl resources have provided hunting recreation which exceeds an average of 10,000 man-days per year for the period 1962-1965. This single segment of the recreation business is worth several thousand dollars to the economy of Currituck County and the State. Using the national average expenditure per trip of $6.44 for the waterfowl hunter, as reported in the 1965 National Survey of Fishing and Hunting, U. S. Fish and Wildlife Service, Resource Publication Number 27, we can calculate a minimal theoretical total expenses value of $64,400. This is certainly a minimal estimate for I personally know that in many instances the standard fee for a day's room, board, blind, and guide at Currituck is $60.00 per day. If we could assume this daily rate of hunter expenditure, then one year of waterfowl hunting on Currituck Sound is worth $600,000.

During the 1966-67 waterfowl hunting season, it was estimated that 600 hunter days were expended on 1,200 acres of impounded salt marshes which are managed by the Wildlife Resources Commission for controlling mosquitoes and improving the quality of wildlife habitat. These hunters bagged 1,200 waterfowl, for a success rate of two birds per trip. As a matter of comparison of quality, during the same season, Mattamuskeet hunters averaged only 0.88 waterfowl per trip.

Records of the cost of construction and initial development of these impoundments indicate the investment averaged $34.15 per acre. When amortized over the 20-year life expectancy of the project, the average annual cost per acre is calculated to be $1.70 per acre. Using the 1965 national average expenditure of $6.44 per trip as an index to the public use-value of these impoundments, these 600 hunter trips were "worth" $3,864

(600 x $6.44) or $3.22 per acre ($3,864 + 1,200). Expressed as a benefit: cost ratio, this would be 1.9:1 for waterfowl hunting in only one year. However, to the benefit side of the ledger must be added 500 man-days of high quality fishing @ $4.98* per man-day; and an undetermined harvest of furbearer pelts, including mink, otter, raccoon, and muskrat. Waterfowl hunting and fishing alone result in a benefit: cost ratio of more than 3:1.

These figures, conservative as they are, relate only to a few segments of the wildlife resources indigenous to our estuarine marshes. Were comparable figures available for all phases of wildlife-related recreation, the total would be much more impressive. Even though it cannot be completely documented at this time, it is obvious that (1) there is currently a great amount of public use and demand for estuarine recreation, (2) that there exists an economically feasible potential for the improvement of certain segments of these marsh areas as wildlife habitat, and (3) that these estuarine areas are contributing to the economy of the State and to the well-being of its people.

No attempt will be made here to discuss the values of estuarine areas from the aesthetic point of view, as these values are subject to great personal variation.

In conclusion, it cannot be emphasized too strongly that valuable wildlife resources occur in association with and are totally dependent upon these estuarine waters and marsh lands. In turn, these resources contribute substantially to the economy of the State and to the health and well-being of the people of North Carolina.

By: T. Stuart Critcher, Assistant Chief
Division of Game
N. C. Wildlife Resources Commission

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*1965 National Survey of Fishing and Hunting

NAVIGATION AND PUBLIC WORKS

By: R. J. B. Page,
Department of Water & Air Resources

The inter-relationship between navigation and the preservation of estuarine values comes up in two ways in our day-to-day operations. One is the handling of applications to the Army Engineers for permits for work in navigable waters which are customarily referred to the State for its views. These are circulated to all affected State agencies as a means of formulating a State position in each case. The other is consideration from the State point of view of construction projects for navigation improvements. The views of affected State agencies are similarly solicited in such cases and a unified position is prepared. During the year from the first of November 1966 to the beginning of this month, we have handled 74 permit applications. In one case out of these 74, we have recommended that the permit be denied. This was on the grounds of the effect of the proposed work on State-owned submerged lands. In 24 cases we offered suggestions or requested an inclusion of conditions in the permit, generally in the interest of preventing excessive turbidity or siltation in the water surrounding the work. These figures indicate that we have the means of protecting estuarine values and that they can be used effectively but not unreasonably.

During the same period, five navigation projects were referred by the District Engineer to the State for comment. One concerned the improvement of Banks Channel behind Topsail Beach and Surf City. The principal problem here concerned the provision of areas in the marsh land west of the channel into which the material dredged from the channel could be deposited. An accommodation was reached in postponing the use of one of the areas where it was felt that some damages to marine life might result. Another study would provide jetties in Oregon Inlet and improved channels through and inside the Inlet. In this study, commercial fishing provides much of the justification. Studies of small boat harbors of refuge at Atlantic and Harkers Island were completed and referred for our comments.

The largest navigation project affecting the State is currently the Pamlico River deep draft channel and the State's views were sent to the District Engineer early in September. These views included a request that a detailed biological investigation within Pamlico Sound extending over 3 to 5 years should be conducted as part of the authorized project, since available biological data are insufficient to permit accurate prediction of the project's effects on the Pamlico Sound ecosystem. Late in October, Secretary Udall of the Department of the Interior voiced opposition to the navigation project. He takes the position that biological studies such as these the State has requested should be complete before authorization of the project by Congress. The State's views, of course, include the State's interest in both the protection of its estuaries and the economic development of the eastern part of the State, and make provision for protection of estuarine values while permitting maximum speed in providing the deep draft navigation channel.

The processes for formulating the State's views on both permits and projects are based on the principles of having each functional agency independent to give maximum protection to its function; and of resolving conflicting views at the lowest possible level. The Department of Water and Air Resources, in addition to being the champion of navigation and water quality, is also designated as the coordinator to formulate the State position. The record of timely response to the large number of permit applications and to complex project considerations, and the evidence that opposing views are honored in the process, show that the system is workable. That is not to say that resolution of many problems is not difficult because of natural conflicts between navigation, property ownership, fish and wildlife considerations, and other aspects of development in estuarine areas. Looking ahead, we know that we have problems coming in the provision of future spoil areas along the Atlantic Intracoastal Waterway, and this is true of smaller navigational developments also. While we manage to handle our problems at present, it is going to become increasingly difficult to do so. In very recent years there has grown an awareness of the true value of estuarine areas, and they are no longer considered a useless wasteland. The fact that they are limited in extent, and that some large portion of them must be preserved is now appreciated. This makes it mandatory that we address studies to the determination of the amount and location of estuarine lands that must be protected against navigational improvement, commercial development, or any other impairment of their natural values. This would be an extension of the studies on the Pamlico River deep draft channel which both Secretary Udall and the State have asked for, though we do not concur on the timing for them. The need for the studies on the Pamlico channel is based on the lack of knowledge of the effects it might produce, and the timing is estimated at three to five years. I have no idea how long it might take to delineate these parts of the entire estuarine area of the State which should be protected at all costs, versus those in which development could be permitted.

In fact, I have misgivings about our ability to make such studies analytically with a degree of accuracy which would satisfy all interested parties. Not only are the magnitude and complexity of the problem staggering, but the consequences are so permanent in nature that we cannot afford to be wrong. It would be unacceptable, for instance, to drive a desirable species of marine life from our area, or even possibly to extinction. On the other hand, all of these areas are in the eastern part of our State, which needs development right now to bring it up to the level of well-being of most of the rest of the State. In order to expedite reaching a conclusion, I suggest that we add to our normal study processes a look back into history for experience over a period comparable to that to which we will be committing our resources. As one possibility, we might consider the draining of the Fens on the east coast of England.

The Fens, by the time of the coming of the Romans to England, was an area of which about 2,000 square miles, essentially under water and forming the estuary of the Wash River. This area is about the same as that of Hyde and Pamlico Counties put together. Parenthetically, it is reported that the Fens at the time were haunted by immense flocks of starlings. The Romans did some work in building dikes to reclaim parts of the Fens, but it was not until the Middle Ages that strong efforts were made. Even by then the basic nature of the areas was not significantly changed. However, sufficient work had been done to encourage some development within the Fens to the point that periodic breaks in dikes would cause a clamor for further improvement, and in the early 1600's a Dutch engineer was brought to take charge of the work because of the broad experience of the Dutch in reclamation of their own lowlands. His work was essentially drainage by improving the streams flowing through the area but also included construction of protective dikes. Opinion on the work was divided. The feeling between the Fen-men and the dike-builders with their Dutch engineers was so intense that it actually contributed to the Great Rebellion. A poem of the era presents the Fen-men's views:

> Why should we stay here, and perish with thirst?
>   To th' new world in the moon away let us goe,
> For if the Dutch colony get thither first,
>   Tis a thousand to one but they'll drain that too!

By the latter part of the last century, the work was complete. I am not in a position to draw a conclusion as to the loss of this much estuarine area, plus similar areas in Holland and the Frisian Islands which also border the North Sea. I suggest that lessons may be drawn from it by those who are qualified to study estuarine ecology.

If by this process, or by any other, we can come to an early conclusion as to how much of the estuaries should be kept sacrosanct, we would be in a position to prohibit development of some areas with assurance that improvements for navigation or other purposes might safely go ahead in others.

INTER-AGENCY COUNCIL ON NATURAL RESOURCES
November 21, 1967

REAL ESTATE DEVELOPMENT ALONG NORTH CAROLINA'S ESTUARIES

Mr. James R. Hinkley, Division of Community Planning
Department of Conservation & Development

The attitudes that people have about being near the water are unbelievable. There are those who spend every weekend possible on North Carolina's rivers and sounds, and on the ocean. They leave home immediately after work on Firday, and they do not begin their return trips until the sun has begun to set on Sunday evening. Evidence of this practice can be seen in the high weekend traffic volumes on the State's highway arterials leading to the coastal sections. Water recreation and rest and relaxation are the obvious reasons for this weekly erodus. However, one must also consider the prestige attached to spending one's weekends and vacations in the coastal area and to the owning of a cottage or home for retirement purposes.

Waterfront subdivisions are cropping up at many places along the State's tidal waters, but the most significant instances can be found in the vicinity of the popular resorts, i.e., Nags Head, Kill Devil Hills, Kitty Hawk, Emerald Isle, Wrightsville Beach, etc. I am unable to tell you the total number of subdivisions which are now being developed along the estuaries of the state, but in the area in which my office serves (Onslow County to Virginia state line) there are at least a dozen.

Realizing the desirability of living on the water, developers are ready to apply as many means as possible to offer the most waterfront property for sale. For instance by dredging, cutting, filling, and bulkheading they can sometimes more than double their front footage on the water. Also they can install jetties to stabilize shorelines. They can pump in sand to establish beaches, and so forth.

Unfortunately, not all development which has taken place along our estuaries is of the highest quality. Indeed, much of it is well below good land planning standards. For instance (example of a substandard subdivision plat) here is a subdivision which has a poor street layout. The streets are arranged so that fast through traffic in residential neighborhoods, an undesirable factor, is encouraged. Created in the design are acute intersections which make it necessary for awkward vehicular movements when executing turns. Also, there are exceptionally sharp curves in the streets which impair safe movement of automobiles. Looking at lots in the subdivision, one can see that they are much too small for an area with no public water and sewer systems available. These lots are as small as 8750 square feet in size, with 50 foot widths and 175 foot depths. Where some lot splitting apparently has occurred on the sound frontage, lots are as small as 3750 square feet in size with widths of 25 feet and depths of 150 feet. The State Health Department recommends that residential lots without services such as public water and sewer should be no less than 20,000 square feet. However, this is not state law; it is only a recommendation. FHA and VA require that such lots shall have a minimum of 20,000 square feet before loans will be insured. This subdivision could conceivably house a population of 3405 people if each of the 1135 lots contained a single family residence that could house an average of three persons. Could you imagine a community of this size with no public water and sewer? Could you possibly imagine the pollution problem which would be created?

A majority of the lots are not fronting on the sound or interior waterways. There is a water access area and marina set aside for the would be owners of these interior lots. However, the facilities appear to be inadequate for the one to two thousand people who might be using them someday.

Prices in this subdivision start at $699.00 for interior lots. All the sound-front lot prices are much higher. Of the over 1100 lots in this development, it appears that few have been sold. Available lots on the waterfront which usually sell first are in abundance.

An example of a well planned subdivision is this plat of Colington Harbour on Roanoke Sound near Kill Devil Hills. Here the maximum water frontage possible is being created by dredging, cutting, filling, and bulkheading for a stretch of ten miles. Here a water system is being laid, and streets are being paved to meet North Carolina Highway Standards. Wherever possible through traffic is discouraged; intersections are at right angles; streets are laid out in accordance with the topography; lot sizes are large enough to accommodate safe septic tank operation; and recreation areas and interior-lot-owner access to the water are sufficient.

The developers are making a $2,000,000 investment in this subdivision. Their goal is to assure that the buyer will be subjected to as many amenities as possible which are commonly associated with waterfront development. Since July 1, 1967, over 400 lots have been sold. Beginning lot prices here are $1995 with membership in a yacht and racquet club included.

Along our tidal waters there is a definite relationship between the design quality and number of improvements included in subdivisions and the success of selling off lots in them. This is obvious, particularly on the outer banks, where both "standard" and "substandard" subdivisions can be compared. Apparently people are becoming more knowledgeable of the advantages and disadvantages of good and poor design and adequate and inadequate improvements in new subdivisions. They are learning that one only gets what he pays for and that it is worth investing in the higher priced well planned subdivision.

Slide #1 SOUTHERN SHORES SOUNDSIDE SIGN - People, nowadays, are looking for amenities which will contribute to their happiness. This subdivision sign indicates the advantages which are offered by the development.

Slide #2 COLINGTON HARBOUR WATER MAIN AND STREET IMPROVEMENTS - This subdivision has appeal to those who want to make a sound investment. Public water systems are in demand not only for drinking and domestic purposes but for fire protection also. Streets constructed according to North Carolina Highway Commission standards assure the investor that he will not be subjected to repair and repaving assessments in the near future and that quality maintenance will be a continual operation upon acceptance by the State.

Slide #3 BLACK BEARD BEACH SIGN AND HOMES - Developments with few or no improvements do not have the appeal that others have. This subdivision which may be several years old does not particularly have an air of success about it.

Slide #4 KITTY HAWK WOODS SIGN - Does low initial investment justify itself? Four hundred lots have been sold at Colington Harbour since July 1, its opening day. This sign is more than likely several years old; there is no evidence that there is construction going on presently and that the developers are having great success in selling lots.

Sign #5 CAPE COLONY WATERFRONT LOT - This lot is about 25 to 30 feet in width. It may have been the result of a 50 foot lot cut in two so that more frontage would be available on Albemarle Sound. The depth is 175 feet. Its area of 5,000 square feet is about 15,000 square feet less than the 20,000 foot recommendation of the State Health Department.

Slide #6 CAPE COLONY - These residences may have been constructed for speculative purposes. The lack of improvements (street paving, curb and gutter, water and sewer) more than likely have stymied the sales potential of the subdivision.

Slide #7 COLINGTON HARBOUR DREDGING AND BULKHEADING - The lengths and expense to which people will go to have frontage on the water are shown on the next several slides. The goal in this operation here at Colington Harbour is to create as many lots with water frontage as possible.

Slide #8 COLINGTON HARBOUR DREDGING - By the time this project is completed there will be about ten miles of frontage bulkheaded in this subdivision alone.

Slide #9 COLINGTON HARBOUR BULKHEADING - Included in this subdivision is a boat basin for those who will not have waterfront lots. In this subdivision, undesirable (low lying and wet) land is dredged to create more water exposure, and marginal land (susceptible to periodical flooding) is made usable by applying the spoils from the dredging operation.

Slide #10 WRIGHTSVILLE BEACH SUBDIVISION - The best use of land is not always applied. Here is a case where residential land is being eked out of what appears to be a potential trouble spot for investors insofar as flooding is concerned. This is a very good example as to what extent man will go to be on the water.

Slide #11 LAND FILL SOUTH OF CAMDEN - Land along highways and the water is at a premium. Here is where an active filling program is being carried on. A use which desires land in such areas is motels. An overnight facility with both good highway access and the amenities of water frontage is very attractive to the public.

Slide #12 LAND FILL SOUTH OF CAMDEN - Often land fills can become eyesores. Here is a case where land is being made more usable on the waterfront on an inactive basis (whenever fill material is available it is applied). In many cases the best type of fill is not used. High waters can float it away, and solid foundations are not always the end result.

Slide #13 CAUSEWAY BETWEEN MANTEO AND WHALEBONE - A familiar sight along causeways throughout the estuarine areas of the state is the small restaurant or service station constructed on created land.

Slide #14 WATERFRONT IN DOWNTOWN MANTEO - A sight which is becoming more and more familiar along our estuaries is the dumping ground. These wrecks probably have been here for a long time. All of these automobiles are late 40's and early '50's models.

What can be done to assure that the proper use of land and good land development take place in the future along the waters in North Carolina's coastal area? First, Land Planning can be applied. Based on surveys, analyses, and development standards, the highest and best usage of land can be determined and projected into the future. Second, in accordance with the plans that are formulated, implementing ordinances can be adopted. With proper administration, the application of legal tools such as zoning ordinances and subdivision regulations, geared to sound planning, can bring about desirable development. Zoning Ordinances regulate the use of land and buildings, and Subdivision Regulations regulate the layout of land. These two basic planning "tools" coupled with building, electrical, plumbing, and housing codes can be applied to guide development along the estuaries of North Carolina.

The real question is will they be applied?

Except for a few, local municipal and county governments have the power through the General Statutues to apply these tools in accordance with planning, but all local governments are not prone to apply controls of this nature in their jurisdictional areas. For instance, Dare and Carteret Counties already have Land Development Plans with implementing tools geared to them. Currituck and Beaufort have completed land potential studies, but have yet to enter the planning stage of their programs. Pamlico and Onslow Counties are just embarking upon planning programs and should have plans for future land use in about two years. The Ten County Albemarle Area Development Association through its Planning Commission has just published its plan this year, but it has yet to begin to look into the complicated process of implementation through land use and land development regulation on a multi-county level. In addition, the communities of Edenton, Hertford, Elizabeth City, Washington, New Bern, Beaufort, Belhaven, Newport, Wilmington, and several others on the sounds and rivers of the coastal area have planning programs and regulations which guide development.

Presently, however, and I am very sorry to report this, there is only one county on the coast that is effectively administering the layout of subdivisions and the zoning of land uses; this is Carteret County, one of 18 counties that have frontage on a sound. Others such as Currituck and Dare have adopted regulations but apparently do not maintain a high standard of administration and enforcement, if, in fact, they administer the regulations at all. Therefore, until all counties bordering sounds are willing to jump on the planning bandwagon, there will be no assurance that proper land use control and proper land layout regulation will be applied.

Because the popularity of being near or on the water is increasing, the demand for land will become greater. The magnitude of development along coastal waters will become greater. The magnitude of development along coastal waters will increase substantially in proportion to the population's growth, affluence, and mobility. Development, if not controlled at the local level will continue unguided with the results which have been brought out today.

Local government officials must be sold on the importance of planning. Their interest on waterfront development particularly must be increased. It is obvious to us here that development guidance is necessary; we know that valuable assets are slipping through out fingers, but do local officials realize the magnitude of this problem. Why are they not applying the powers they have at their own fingertips? Are they totally oblivious to the situation? If they are, then we have our jobs cut out for us.

LEGAL PROBLEMS INCURRED IN NORTH CAROLINA ESTUARINES

The importance of estuarine areas has already been shown; but before effective conservation plans can be furnished, ownership of these areas and their inhabitants must be determined. Wildlife resources in their natural state are owned by the State in trust for the people of the State. Fish and shellfish are among these wildlife resources, but shellfish can be personal property owned by individuals. Shellfish are not migratory and, when planted in privately-owned artificial beds or on privately-owned real property, they are personal property.

Therefore, title to shellfish is dependent upon the title to the land upon which they are found.

According to the laws of this State, the State owns all land lying under navigable waters. Few attorneys would dispute this broad general statement, but exactly what is navigable water has been subject to a dispute of long standing and some litigation. An examination of the General Statutes of the State of North Carolina, and the decisions of the North Carolina Supremen Court, does little to clarify the confusion of said definition.

The North Carolina General Statutes declare that water navigable in fact is navigable in law, but we are not told what the General Assembly meant by "navigable." The North Carolina Supreme Court has said that rivers, inlets, water course, etc., capable of being navigated by ocean going vessels are navigable. A conclusion which I would not dispute. But, what about land covered by enough water at high tide to be "navigated" by small pleasure craft but not covered or slightly covered by water at low tide.

Another problem encountered in the attempt to determine who owns what in the marsh lands of this State is determining what area is covered by a given grant or deed. A common way of describing property is by courses and distances running from natural monuments or objects. At this time, the State is involved in a controversy involving land in an area designated as a State Oyster Management Area. The State needed the area with oysters with the intent to further the oyster industry for the benefit of all of the people of this State. Now, private individuals have erected or caused to be erected signs prohibiting the public from entering this area and have directed the local people, many of whom derive part of their livelihood from oystering, to stay out of the area and not take any oysters.

The earliest description of this property starts at the mouth of Spring Branch and runs thence a certain course and distance to a point; thence another course to a river; thence with the river to the point of beginning. This particular description raises two questions. In 19081 where was the mouth of Spring Branch? And, where was the river and how did it meander 60 years ago? During the past 60 years, the intracoastal waterway and other channels have been dug through the area. Attorneys for the party claiming ownership say they do not know exactly where the property is either. At least we know where Spring Branch is; other descriptions start on or are bounded by creeks and branches nobody can find.

The importance of knowing what is navigable water arises again in construing description in deeds conveying title to lands bounded by water. Unless a description contains a specific limitation on the boundary, a deed conveying property adjoining non-navigable water not only conveys the land above the water and also the bed of the stream to the center of the stream. Of course, if the water was navigable, the same wording would convey title only to the high water mark.

We are all familiar with the process of acquiring title to property by means of conveyance by deed, and most people are aware that many claims of title start with a grant from a soverign body. Another important way of asserting title which has been successfully used against the State in estuarine lands in North Carolina is by adverse possession. Whether or not a person has a deed or any other paper purporting to convey title to him, title can be vested in an individual by law. Where the claimant has no color of title, he must prove that he has had actual possession of the land for 30 years, and such possession was open, visible and hostile to the interest of all others. The Court has held that the posting of notices against trespass is sufficient to satisfy the requirements of actual and open possession. It should also be noted that actions involving title to real property are civil in nature and therefore do not require proof "beyond a reasonable doubt", but only by the "preponderance of the evidence."

Regardless of ownership, how can land uses be regulated? We all know that governing bodies have some power to tell us how we can use our land. And, we all know that zoning ordinances have been held valid and constitutional. Could the State pass a law restricting the use of estuaries to their natural biological function? Any such regulation would have to fall within the police power of a state to protect or promote the public health, safety or welfare. When pondering this question, we must bear in mind the constitutional prohibitive against taking property without the process of law. Massachusetts has enacted a statute requiring a permit to dredge in marsh lands. This statute was held constitutional but the court cautioned that conditions and restrictions in the permit could limit the use of said land enough to constitute a taking without due process.

Whether or not such restrictions are or are not repugnant to the constitution is purely academic if there is no one or no way to enforce the restrictions. One needs to look no farther than on traffic courts to see how ineffective laws can be. Many would rather speed and pay the fine than to obey the law. This principal can be applied to out situation. If a man is dredging in marsh land and he is told to stop; if he doesn't stop, then what. A man creating valuable real property would probably be glad to pay small fines all day long for the privilege of breaking laws enacted to protect estuarine areas.

Each piece or parcel of land, no matter where it is situated, is as unique as an individual. The fact that land is unique has long been established in our law. Uniqueness is the quality that makes land subject to a suit for specific performance, that is for the Court to order that certain pieces of land be transferred to another person. Land in estuarines is like all other land in that each tract must be examined as an individual. The problems previously raised can be solved with the technical knowledge and laws we have today. But such a solution would involve litigating each claim and each tract. This method is not only time consuming, but the costs would be astronomical. And, there is little reason to believe that results would be uniform. A jury could find that the river in front of loan shark Brown's property to be navigable and the same river to be non-navigable in from of Brown's next door neighbor good old Joe. It is true that decisions by the North Carolina Supreme Court are controlling on the Superior Courts, but the Supreme Court does not like to formulate rules and definitions. The Court will decide nothing more than is absolutely necessary to decide the case they are hearing.

Perhaps the best approach is through legislation. The State certainly could enact any controls necessary and enforce these controls if the State owned the land. I do not know for a fact, but I believe that the costs would be less for everyone if the State, in an action similar to a condemnation, took title to all of these lands and provided for an efficient, cheap, tribunal to adjust the claims of individuals to such property. The rulings of such tribunal would, of course, be appealable to the Superior Court.

Let me emphasize that these lands are soluable. In many instances, the owners could create water front lots from them and reap immediate profit. We also know what they are worth in the long range in their natural state. The preservation of North Carolina's estuaries is worth the time, effort, and expense consumed in their conservation.

AN INVESTIGATION OF THE ALTERATION OF COASTAL MARSHES IN NORTH CAROLINA

INTRODUCTION

The Director of the North Carolina Wildlife Resources Commission received a request from Mr. George P. Spinner, Project Director of the Marine Resources Committee for assistance in determining the location and extent of coastal marsh losses in North Carolina since the cooperative Federal-State wetlands servey in 1954.

Information concerning North Carolina marshes (included in the 1954 wetlands survey) was obtained largely from aerial photographs and evaluated by River Basins' biologists of the U. S. Fish and Wildlife Service. A report titles "North Carolina Wetlands" by Kenneth A. Wilson of the N. C. Wildlife Resources Commission, published in April 1962, utilized data secured in the earlier surveys and expanded on the information after intensive field evaluation.

Biologist Wilson's report showed essentially the same distribution of North Carolina wetlands as did the 1954 survey. It was therefore considered suitable for use as a reference to determine changes which have occurred to the State's marsh lands during the past fifteen years.

PROCEDURE

Thirteen counties were selected along the North Carolina coastline which contained significant acreages of marsh land as listed in "North Carolina Wetlands."

Wildlife Protectors, Fish and Game Biologists, Soil Conservation Service and A.S.C.S. personnel, County Extension Agents, local health departments, and individuals with knowledge of alterations to marshes which have occurred within their respective counties were contacted for assistance.

Aerial photographs were analyzed to check and confirm information secured from the field. No doubt, some alteration of marshes in certain localities could have been overlooked, however, the information acquired is believed to be as accurate and complete as could be obtained during the limited time available to complete an investigation.

SUMMARY

A total of at least 45,776 acres of coastal marshes (Types XII, XVII, and XVIII) has been altered in North Carolina during the past fifteen years. This represents approximately 22.2% of the total of 206,350 acres of marshes listed in the thirteen counties surveyed.

Slightly over 1% of the Shallow Fresh Marsh (Type XII) has been altered (484 acres of 47,500). However, alteration of Irregularly Flooded Salt Marsh (Type XVII) equals 26.7% (26,844 acres of 100,450) and alteration of Regularly Flooded Salt Marsh (Type XVIII) is over 31.9% (18,448 of 58.400).

Flooding for waterfowl development accounted for alteration of 6,468 acres while ditching for mosquito control and land development altered 39,308 acres. Plans are already formulated in several counties for more extensive ditching for mosquito control. This appears to be the single most significant activity which effects alteration of coastal salt marshes.

FINDINGS

Table I

North Carolina Coastal Marshlands Altered in Past Fifteen Years

County	Marshland Acreages According to "North Carolina Wetlands" by Kenneth A. Wilson, N. C. W. R. C.	Changes in Past Fifteen Years	Local Observer
Beaufort	4,050 acres, Type XII 450 acres, Type XVII	No significant alteration	Freelan L. Fraley Wildlife Protector
Brunswick	3,500 acres, Type XII 18,000 acres, Type XVIII	225 acres Type XII have been altered --200 for highway construction, 25 for Battleship North Carolina 2,700 acres of Type XVIII have been altered for land development	Hal Atkinson Wildlife Biol.
Camden	1,600 acres, Type XII	No significant alteration	Frank Veach Soil Conservationist, USDA
Carteret	38,600 acres, Type XVII 10,000 acres, Type XVIII	3,978 acres of Type XVII have been altered (200 for land development and 3,778 for mosquito control) 1,000 acres of Type XVIII have been altered for mosquito control (ditching)	James Lewis Wildlife Protector
Craven	3,100 acres, Type XII	209 acres Type XII have been altered (100 acres for city dump, ditching and filling, 25 acres ditched and 50 acres filled on Shinner tract, 16 acres altered at New Bern shipyard, 5 acres altered by paper company, 8 acres altered by Superior Stone Co. 5 acres altered by Hatteras Boat Co. for boat launching ramp)	Sam Poole Wildlife Biol.
Currituck	23,600 acres, Type XII	No significant alteration	Tom Crowell Fisheries Biol.

Dare	5,200 acres, Type XII 15,500 acres, Type XVII 500 acres, Type XVIII	Approximately 4,000 acres Type XVII altered on Pea Island Wildlife Refuge for waterfowl development and mosquito control (ditching and diking to flood) Another 3,000 acres near Wanchese has been ditched for mosquito control with plans to ditch all marshes in county already made	Claude Jones Soil Conservationist USDA
Hyde	3,400 acres, Type XII 29,900 acres, Type XVII 1,600 acres, Type XVIII	Approximately 300 acres of Type XVII altered at Gull Rock Waterfowl Impoundment (diking and flooding for waterfowl management by NCWRC) 200 acres of private land for waterfowl development	T. H. Robbins Wildlife Patrolman with assistance from SCS and USF&WS
New Hanover	2,500 acres, Type XII 7,850 acres, Type XVIII	50 acres Type XII have been flooded for waterfowl development. 3,398 acres, Type XVIII have been altered for land development	Hal Atkinson Wildlife Biol.
Onslow	1,000 acres, Type XVII 11,350 acres, Type XVIII	10,650 acres Type XVIII have been altered for mosquito control (ditching) 700 acres Type XVIII altered for waterfowl development (diking and flooding) 1,000 acres Type XVII have been altered for land development (filling)	Paul Metters Wildlife Patrolman
Pender	9,100 acres, Type XVIII	No significant alteration	Paul Metters Wildlife Patrolman
Pamlico	15,000 acres, Type XVII	802 acres altered for waterfowl impoundment at Pamlico Point (diking and flooding) 42 acres altered at Hobucken ImPoundment for waterfowl development (diking and flooding) 1,074 acres altered at Paradise	Sam Poole Wildlife Biol.

		Point by waterfowl impoundment of Morris and Joe Bloe (diking and flooding) 10,783 acres have been altered by ditching for mosquito control (Jack Taylor Marsh) 640 acres have been altered for mosquito control (Cameron Marsh) 25 acres have been altered by man-made potholes	
Tyrrell	550 acres, Type XII	No significant alteration	E. L. Mosley Wildlife Protector

TABLE II

Summary of Marshland Acreages Altered and Causes of Alteration

County	Acres Altered	Method (Flooding-Filling-Ditching-Other)
Brunswick	225 acres, Type XII	Filling
	2,700 acres, Type XVIII	Ditching and Filling (for land development)
Carteret	3,978 acres, Type XVII 1,000 acres, Type XVIII	Ditching and Filling (for mosquito control and limited land development)
Craven	209 acres, Type XII	Ditching and filling
Dare	7,000 acres, Type XVII	Ditching, Diking and Flooding (for mosquito control and waterfowl development)
Hyde	500 acres, Type XVII	Flooding (for waterfowl development)
New Hanover	50 acres, Type XII	Flooding (for waterfowl development)
	3,398 acres, Type XVIII	Ditching and Filling (for land development)
Onslow	1,000 acres, Type XVII	Ditching and Filling (for land development)
	11,350 acres, Type XVIII	Ditching (for mosquito control)
Pamlico	1,918 acres, Type XVII	Flooding (for waterfowl development)
	12,423 acres, Type XVII	Ditching (for mosquito control)
	25 acres, Type XVII	Other (potholes)

TABLE III

Types and Descriptions of North Carolina Marshlands

Shallow Fresh Marsh (Type XII

Most of this type lies in the Currituck-Albemarle sounds area and along the Cape Fear River near Wilmington. These soils are waterlogged or flooded. Wind tides periodically flood marsh with one to 12 inches of water. Principal plants are threesquare, cattail, needlerush, sawgrass, big cordgrass, pickerelweed, spikerush, smartweed, rosemallow, and waterlily.

Deep Fresh Marsh (Type XIII

Most of these sites are flooded the year-round by six to 20 inches of water. Vegetation consists principally of cattail, pickerelweed, muskgrass (Chara), sago pondweed, and waterlily. There are about 600 acres of this type in the state.

Irregularly Flooded Salt Marsh (Type XVII)

This cover type represents the bulk of all the marsh in the state. It is found in greatest quantity along the coast from Roanoke Island to Atlantic. These sites are flooded periodically by wind tides with from a few inches up to two feet of water. Vegetation consists largely of needlerush, saltmeadow cordgrass, sawgrass, and saltgrass with scattered pickets of threesquare. Some potholes and man-made ponds support dense stands of widgeongrass.

Regularly Flooded Salt Marsh (Type XVIII)

Most of this type lies along the Outer Banks from Oregon Inlet to Ocracoke and between Beaufort and the S. C. state line along the coast. Normal flooding at high tide ranges between a few inches and three feet. Needlerush and saltmarsh cordgrass are predominant. Plants found in lesser quantities are saltgrass, saltmeadow, cordgrass, and glasswort.

By: George E. Burdick, Wildlife Biologist
Division of Game
N. C. Wildlife Resources Commission

POSSIBLE STATE PROGRAMS FOR ESTUARINE MANAGEMENT

So coastal marshes and shallow waters are important. So they're important for hunting, fishing, boating, bird-watching, land development, and navigation. So what? "What" is that many of these uses are incompatible on the same area. "What" is environmental changes resulting from some uses are irreversible, and preclude equally-desirable uses for all time to come. "What" is that there's a definite limit to the amount of such areas available to this, and succeeding generations, and that decisions made now will be binding on these future generations. And, perhaps most pathetically, no one is in a position to make the necessary policy decisions, no one is effectively attempting to determine the proper mix of competitive uses, no one has the necessary responsibility and authority.

As a result, marshes, tidal creeks, flats, and shallow waters are being engulfed, bit by bit, by real estate development and dredging spoil, without any apparent rhyme or reason, without any plan or rationality, without realizing that the major attractant, i. e. the typical coastal landscape, is being destroyed by those who are attempting to capitalize on the same attractant. Not that all development is bad, for there must be access and accommodations for those who wish to enjoy our coastal areas (and contribute to the local economy through their enjoyment). The issue here is not one use or the other applied to the entire system, but each use in its proper place, and all in proper perspective.

In most cases, the profit motive is sufficient to encourage those interested in land development to keep up with demand. It is the contrary use, preservation of sufficient area in at least quasi-natural condition, that deserves the attention of the public at large, If such an endeavor is to be successful:

1. An element of the population must recognize the importance of rational use of estuarine areas and actively work toward preserving some portion of these lands and waters.
2. Some public agency must be assigned responsibility for the program, and must be given the necessary money, people, and time with which to implement it.
3. Coastal areas must be inventoried and classified as to their best use, and those which must be preserved in the public interest identified as such.
4. A large scale program of control and acquisition, involving a number of alternative methods, must be developed for those areas which should be reserved for public use.

PUBLIC SUPPORT

For generations, we have viewed the coastal waters and marsh lands as an infinite resource, fully capable of withstanding the puny efforts of man to alter it in any significant manner, fully capable of providing a bountiful supply of fish, fowl, and recreation for all who wished to partake. For past generations, this attitude was probably realistic, for supply far exceeded demand and our capability for altering the landscape was limited. Today's generation cannot afford such complacency. On a national level, the number of saltwater sport fishermen increased 38% between 1955 and 1960, and another 32% between 1960 and 1965 (U. S. Department of the Interior, 1966). Now on the North Carolina coast, there are more than 400,000 sport fishermen competing with about 5,000 commercial fishermen for the same fish. Annual attendance at Ft. Macon State Park increased from 357,965 in 1956 to 599,149 in 1966; visitors at Cape Hatteras National Seashore, during the same period, increased from 301,740 to 1,133,003. The U. S. Army Corps of Engineers issued no permits for land development projects in 1965; four in 1966, and nine during the first ten months of 1967.

Slowly, people are beginning to realize that this resource is not infinite, that it is being changed by the hand of man. The oystermen are concerned that traditional oystering areas are being closed because of sewage pollution. The fishermen are concerned that they are not catching as many fish as they wish. The bird watchers are concerned that subdivisions are springing up where shorebirds used to feed. The aesthetic is concerned that he can no longer gaze upon an unbroken expanse of primeval landscape. But each is concerned with his own interest, and there is no unifying agent which brings all users together in common understanding of the resource as a whole.

Who shall bring these diverse groups together in the common interest? The North Carolina Wildlife Federation? the Garden Club of North Carolina? the League of Women Voters? All these groups have led the fight for conservation issues in the past, but none has yet come forward to save our estuaries and coastal marshes. Unless someone does, no public program can be successful.

AGENCY RESPONSIBILITY

Just as there has been no unified effort outside of government, there is also no unified effort within government. A number of local and state agencies have responsibilities in these areas, but none is considering the coastal lands in their entirety. Municipal and county agencies conduct land-use planning of various sorts and enact zoning ordinances as a means of controlling land use, but most of these efforts are of a local nature, aimed more at what types of development should be permitted on a given area of land rather than whether development should be permitted at all. Within the state government, the Wildlife Resources Commission has jurisdiction over hunting and motorboat safety in coastal waters; the Department of Conservation and Development regulates fishing and mineral exploitation, and assists local governments in planning; the Department of Water and Air Resources controls pollution, navigational development, beach erosion and hurricane protection; the State Board of Health is concerned with the sewage pollution in shellfish growing areas; the Department of Administration has jurisdiction over state-owned lands and waters.

As a result, no single agency views the estuaries as its sole responsibility and "that which belongs to everyone belongs to no one." If a comprehensive estuarine program is to be successful, some public entity must be given the responsibility and authority to carry it out. This entity could be one of the existing state departments, a division guided by a special board drawn from several departments, or a special committee or board established for the purpose.

LAND INVENTORY AND CLASSIFICATION

Since 1953, the Soil Conservation Service has been classifying interior land as a means of determining its best agricultural use. Planning agencies classify land as to its best type of development. Fish and game agencies classify land as to its greatest potential for wildlife management. But no one has taken a comprehensive look at our great expanse of coastal land with the aim of guiding a balanced development for all uses.

At the present time, the State doesn't really know how much of our shallow coastal waters are in State ownership (although almost all of them probably are), how much of the coastal marsh lands are privately owned (although almost all of them probably are) nor how much of these types of areas and which specific areas need to be under public control in order to provide adequate recreational opportunities for future generations. In essence, we need to have an inventory, by ownership, type of land, potential for development, natural resource value, of all the lands and waters of North Carolina's vast estuarine system. This will be no easy job -- more than 2 million acres of water /USFWLS, 1955/ and about 160,000 acres of marsh (Wilson, 1962) are involved -- but no rational plan for management can be evolved until the resource has been inventoried.

AQUISITION AND CONTROL

Even under existing laws, local and state governments have some measure of control over development in the estuaries. Counties and municipalities are empowered to enact zoning regulations, thereby restricting the types of developments that may be permitted. Zoning regulations may be sufficiently restrictive as to prevent any structures and all land alteration, but examples of such severity are few and far between. From a realistic viewpoint, it seems unwise to entrust local zoning authorities with the primary responsibility for comprehensive planning of estuarine use. A state-wide program, based on knowledge acquired through the study discussed above, would probably stand more chance of success.

At the present time, the State does, or at least can, control the development of most land covered by water, and much of the peripheral tidal marsh. Ownership of land beneath navigable water is in the State, and such land cannot be conveyed from the State. Those wishing to fill such lands adjacent to their privately-owned high land must secure an easement from the Department of Administration, approved by the Governor and Council of State. By refusing to issue such easements, the State can prohibit filling of lands beneath navigable waters, and, to a lesser degree, control development of adjacent land which includes water connections to navigable waters. In addition to the State easement, all persons desiring to do work below the elevation of Mean High Tide in areas adjacent to navigable waters must secure a permit from the U. S. Army Corps of Engineers. Applications for these permits are publicly advertised, and all individuals and state agencies have the opportunity to oppose issuance of such permits. In recent years, the Corps of Engineers has become much more responsive to the recommendations of natural resource agencies, and now will rarely issue a permit over a resource agency's objection.

At first glance, the above procedures might appear to provide adequate means of regulating the development of estuarine areas. There are, however, a number of complicating factors. The term "navigable waters" has never been defined adequately in law. Thus, waters which appear navigable to the State may appear non-navigable to the developer, and only a court can determine who is right. Furthermore, until the State determines which estuarine areas should be held inviolate, and which can be altered without excessively impairing the public resource, it runs a double risk of thwarting desirable development or permitting undue resource damage.

Thus, it appears that public acquisition provides the only definitive solution. The Department of Conservation and Development has powers of eminent domain, and can dondemn land "in the administration of laws relating to fish and fisheries." (G.S. 40-2. (6)). The Board of Conservation and Development can purchase lands for "enterprises related to the conservation of marine and estuarine resources." (G.S. 113-226(a)). Once the locations of significant marsh areas are established, they can be acquired by the State if funds are available.

While it is impossible at the present time to estimate precisely the amount of money needed, some rough approximations may be made. There are about 60,000 acres of regularly flooded salt marsh (low marsh) in the State (Wilson, 1962), almost all of which is of prime importance for fisheries and recreation. If 90% of this area were acquired at $150 per acre, it would take $9 million. Legal fees and land surveys would add considerably to the cost; discovery of lands which are already in the State would reduce the cost. Acquisition of selected areas of irregularly flooded salt marsh (high marsh), fresh-marsh rights-of-way, access, etc., would probably add an equivalent amount, bringing the total bill to about $18 million. A land acquisition program of this size would take several years to execute. Land prices are escalating rapidly, however, and any delay would increase the cost significantly.

Where would the money come from? There are several alternatives, all of which have some weaknesses. The General Assembly could appropriate the necessary funds as part of a biennial Captial Improvement Budget. This method has the advantage of spreading the cost among all taxpayers and would provide a lump sum which could be spent over a number of years. It seems unlikely, however, that such a sufficiently large amount would be appropriated during one biennium; the program would thus become dependent upon additional appropriations during succeeding bienniums -- a risky business at best.

A second alternative would be through a special bond issue. Prior to 1962, New York had passed a $75 million bond issue, and New Jersey a $60 million bond issue for acquisition of recreational land (Outdoor Recreation Resources Review Commission, 1962). Subsequently, other states have adopted similar proposals. Like a direct appropriation, this method spreads the cost among all citizens and provides funds which could be used over an extended period. However, a bond issue of this magnitude would require enabling legislation and a vote of the people, and thus, would entail considerable public support.

A sport fishing license for coastal waters provides a third possibility. At the present time, no license is required of non-commercial hook-and-line fishermen in most estuarine waters. If our estimate of 400,000 coastal sport fishermen is accurate, a modest license fee, over a period of time, could provide sufficient funds for the program. Coastal sport fishing licenses are being required in an increasing number of states, and there has been some talk of such a requirement in North Carolina. Before such a system were instigated, however, some jurisdictional problems between the N. C. Wildlife Resources Commission and the Division of Commercial and Sports Fisheries need to be resolved. Considerable opposition might be raised, too, by out-of-state fishermen, tourist interests, and resident fishermen who are already buying a license for inland fishing, trout fishing, wildlife management area access, etc.

During 1964, North Carolinians operating registered gasoline powered motorboats consumed 6,600,000 gallons of fuel, taxed at the rate of 7¢ per gallon (A Survey of Fuel Usage in Registered Motorboats in North Carolina, RTI, Durham, 1965). Six cents per gallon, or $396,000 was refundable upon application, but only $38,000 of this amount was actually refunded. The remaining $358,000 remained in the highway fund. An estimate of North Carolina's refundable marine fuel tax derived from a survey by the Outboard Boating Club and the National Association of Engine and Boat Manufacturers in 1965 is even higher -- $943,880 (N. C. Wildlife Resources Commission, personal communication).

Whatever the precise amount, motorboat operators probably contribute more than a half million dollars to the highway fund each year through failure to claim their fuel tax rebate. The 1967 General Assembly provided that the "Wildlife Resources Commission shall receive one-eighth of one percent (1/8 of 1%) of the net proceeds of the taxes on motor fuels" (G.S. 105-446.2) during the 1967-69 biennium, but will then have to request a continutation of any such funds from the 1969 General Assembly. This authorization will provide the Commission with about $125,000 per year for its boating program, leaving something in excess of $400,000 per year in the highway fund. Tapping a portion of these funds would provide a continuing source of revenues which could be used in an estuarine acquisition program. However, any efforts to use this source would be met with opposition from the State Highway Department, as they were during the 1967 General Assembly. Furthermore, it appears that the Wildlife Resources Commission has a logical cause in asking for moneys derived from motorboat users for its motorboat program whereas use of this source for an estuarine acquisition program would be placing the burden upon only a small segment of estuary users.

Whatever form of State funding is utilized, federal funds may be available under the provisions of the Land and Water Conservation Fund Act of 1965 (78 Stat. 897). This act, "to assist in preserving, developing, and assuring accessibility to all citizens - such quality and quantity of outdoor recreation resources as may be available and are necessary and desirable for individual active participation in such recreation," provides federal funds on a 50-50 basis for "the acquisition of land, waters, or interests in lands or waters." Earlier federal reports (Outdoor Recreation Resources Review Commission, 1962b) stress the need for federal assistance in the acquisition of recreational lands and the critical need to preserve shorelines and waters for recreational opportunities. Thus, it appears that the State may be required to pay only half of the total bill for an estuarine acquisition program.

So really it boils down to a matter for the people of the State to decide. If they are really concerned enough, some entity can be charged with the overall estuarine preservation-development program, coastal areas can be inventoried and those which must be protected identified, private alteration and use can be regulated, and funds necessary for acquisition can be provided. Hopefully, our citizens are now ready to recognize the seriousness of the present situation and willing to do something about it. If not, we must wait until some future date; in the meantime, we may lose forever a part of our heritage.

Literature Cited

Outdoor Recreation Resources Review Commission. 1962a. Outdoor Recreation for America. U. S. Government Printing Office, Washington. 246p.

Outdoor Recreation Resources Review Commission. 1962b. Shoreline Recreation Resources of the United States, Study Report No. 4. U. S. Government Printing Office, Washington. 156p.

Statistics Research Division. RTI. 1965. A Survey of Fuel Usage in Registered Motorboats in North Carolina. North Carolina Wildlife Resources Commission, Raleigh, North Carolina.

Wilson, Kenneth A. 1962. North Carolina Wetlands Their Distribution and Management. North Carolina Wildlife Resources Commission, Raleigh, North Carolina. 169p.

U. S. Department of the Interior. 1966. 1965 National Survey of Fishing and Hunting. Resource Publication 27. U. S. Government Printing Office, Washington. 76p.

U. S. Fish and Wildlife Service. 1955. North Carolina Classification of Permanent Water Areas Important to Waterfowl. Atlanta, Georgia. 4p. and appendices.

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Waves of Development Threaten The Tidewater

[illegible]

PHOTO BY TOM JACKSON

"THE history of our estuaries has been one of steady and accelerating destruction. Today the condition of our estuaries is shocking, their future is bleak, and the need for action is urgent."

That statement, made last summer by an assistant secretary of the Department of Interior, Frank Di Luzio, was not directed at an audience of North Carolinians. But it should have been. For of all the states, only two, Alaska and Louisiana, have more extensive estuarine areas than North Carolina. And perhaps no state is destroying the productivity of its estuaries as rapidly as this one.

Studies made in recent months indicate that in the past 15 years almost one-third of North Carolina's prime coastal marshlands have been so abused by man that they no longer can fully serve their important natural functions.

The truly disturbing fact is that these marshlands are a part of an estuarine environment which probably is the most valuable—and certainly the most vulnerable—of all the varied types of natural environment to be found in this richly endowed state.

This is tidewater North Carolina, a complex environment made up of salt, brackish and fresh water, and regularly flooded salt water marshes, irregularly flooded salt water marshes, and high, infrequently flooded fresh water marshes.

Two Million Acres

This estuarine region covers more than two million acres, most of it included in the great island sounds: Currituck, Albemarle, Roanoke, Croatan, Pamlico, Core and Bogue. Then there is the string of small sounds to the south of Carteret County—Stump, Middle, Masonboro, Topsail, and others—and the mouths of the rivers which empty into the sounds or, in the case of the Cape Fear, into the ocean itself. Equally important are the fringes of marsh that edge the sounds, the river mouths, and the lee side of the Outer Banks.

There was a time, and not so long ago either, when this watery area—most particularly its reedy marshes—was considered to be of little economic importance. We know better now. As Dr. Eugene P. Odum, an authority on the comparative productivity of various environments, recently said. "The estuaries are the most naturally fertile areas on earth."

Based on research done in Georgia, Odum concluded that the estuarine marshes there—and they are very like those found in this state—produce approximately 10 tons of dry organic material per acre a year. (Not all of it, of course, usable by man.) This is almost twice the productivity of the productivity of ocean waters along the continental shelf, and 20 times the productivity of the open oceans.

Important to Economy

This productivity explains the immense importance the estuaries have to the economy of this state. That value can be documented in many ways.

The estuaries are the source of most of our shellfish—oysters, clams, crabs and bay scallops, for example. The estuarine waters and their creek-laced marshes are the residence or the nursery for most of the important food and sport fish found on this coast. In 1965 commercial fishermen in North Carolina sold 226 million pounds of fishery products. Of that total, 97 per cent by weight was made up of species which were, one way and another, dependent on the estuarine environment for their survival.

The state's 5,000 or so commercial fishermen are, therefore, utterly dependent on the continued productivity of the estuaries. In 1965 that environment produced a catch valued at dockside at $9.5 million. Processed and sold to the ultimate consumer, the 1965 catch is estimated to have been worth $66 million.

Then there are the 400,000 or so Carolina sports fishermen who, by the most conservative estimates, spent $32 million last year to catch species whose abundance is determined by the productivity of the estuaries.

Most of the waterfowl which come to this state each winter also are dependent on the continued health of the estuarine waters and marshlands. It is estimated that in Currituck County alone hunters spent a minimum of $500,000 last year for the opportunity to shoot at a duck or a goose.

The clapper rail, a resident of the salt water marshes, contributes another, albeit much smaller, source of income for guides in certain of our coastal counties.

And trapping—raccoon, mink, otter and muskrat—is still another source of coastal income ($422,773 worth in 1965-66) that is dependent on the continued

PHOTOS BY TOM JACKSON

Like the tracks of some stiff-legged monster, a drainage ditch and its blobs of excavated earth slice the marsh. Left, miles of these ditches lace a marsh, draining its life.

existence of the estuarine marshes.

The estuaries are a source of mineral wealth that ranges in kind from oil in Louisiana to the enormous phosphate deposits in North Carolina. In this state and elsewhere they are a source of shell, sand and gravel.

And we use these coastal waters for navigation. The Inland Waterway and both our state ports are located in estuarial waters We use them, too, for recreational purposes as varied as boating and bird watching.

That, then, is the value of this natural resource which we are destroying.

The pace of this destruction can be documented.

In 1952 the state of North Carolina made an inventory of its estuarine wetlands. In 1967 biologists of the Wildlife Resources Commission took that 1952 study—one that covered 13 coastal counties—and used it as a reference point to determine what had occurred in the intervening 15 years.

The biologists concluded that in that brief period man had either substantially altered or destroyed 28.5 per cent—some 45,292 acres — of the state's remaining salt water marshlands.

Estuarine waters and marsh are productive and lend themselves to many uses because they are so diverse and complex. Here you have the wash of the tides and the blending of fresh, brackish and salt waters. The estuaries are the place where the inland richness and filth that flow down the rivers are trapped. They are the place, also, where there is a great variety of water depths and temperatures.

These are the characteristics which make the estuaries productive and valuable to man. By the same token, this complexity of characteristics also makes the estuaries peculiarly vulnerable to destructon and change by man's activities.

A part of this destruction and alteration results from pollution, from the municipal and industrial wastes that pour down our rivers to the sounds, from the mounting levels of poison the rivers bring down in the form of herbicides and pesticides, and from the smothering silt the rivers unload each year into the sounds.

Ditching and draining the coastal marshes, most of it done in the name of mosquito control, is another major source of destruction. Two North Carolina counties have ditched every acre of marshland they possess. Last year the board of commissioners of Dare County invested $29,000 in a drag line and announced that it intended to ditch the county's 15,500 acres of salt water marsh.

Such ditching alters, sometimes beyond man's capacity to restore, the character of these marshes.

Another source of destruction is the dredging, filling and bulkheading of marshland to create areas for new housing developments. This is occurring in North Carolina at an unprecedented pace.

James R. Hinkley, a member of the planning division of the state Department of Conservation and Development, says, "I don't know the total number of subdivisions now under development on the estuaries of the state. But in the area served by my office (Onslow County north to the Virginia line) there are at least a dozen."

And these are large developments. The Collington Harbor development on Roanoke Sound has at least 10 miles of waterfront, much of it created by filling and bulkheading on areas that were once natural marsh.

Some of these developments, like the Figure Eight Island project near Wrightsville Beach, are well planned. But even that high-quality project has destroyed much acreage of salt water marsh in order to create additional building sites.

Most of our coastal developments are well planned only in the sense that the developers have been certain to make the maximum number of lots available.

Where there is no provision for water and sewer service—and that is more often the case than not—the State Board of Health recommends lots of no less than 20,000 square feet. Hinkley says that there is one development in his area which is offering 1,135 lots with frontages of 25 to 50 feet. These lots contain from 3,750 to 8,750 square feet.

Such developments pose serious problems for our estuaries. Hinkley says, "Those 1,135 lots very well could house 3,000 or more people with none of them served by public water or sewer lines. Can you imagine the pollution problem that will result?"

Still another major source of estuarine destruction is dredging—dredging to fill land for real estate developments, dredging to maintain navigation channels, and dredging for shell, sand and gravel. Dredging is damaging in several ways. It disturbs the bottom, clouds the water with silt that shuts off the sun from plant life and often smothers plant life. In dredging there always is the question of disposing of the spoils.

Then there is the cumulative effect of varied small encroachments on the estuaries. A section of marsh becomes a dumping ground for garbage and old automobiles. Life in one estuarine area is destroyed by thermal (heat) pollution. Twenty-five acres of fresh water marsh near Wilmington are filled to provide a final berth for the USS North Carolina.

These small, nibbling uses, unimportant in themselves, have a total impact on the estuarine environment that is impressive.

In North Carolina the destruction of this environment by all of these uses has reached the point where it is exacting a heavy toll. For example:

—Dr. David Adams, director of the Division of Commercial and Sport Fisheries, says that this state's fisheries, commercial and sport, are deteriorating because of the destruction of the estuaries. This deterioration will continue, and probably will accelerate, unless the destruction is checked, he says.

—Thousands of acres of important clam-and-oyster-producing areas have either been destroyed by pollution and siltation or have been closed to the public because of health hazards resulting from pollution.

—Few unbroken expanses of coastal marsh remain in the state. The very attraction—unspoiled coastal scenery—that is the basis of the land developers' success is itself being destroyed.

Local, state and federal agencies are interested in the preservation of the estuaries.

The Department of Interior opposes the proposed Pamlico deep water channel (Morehead City to the phosphate-producing area in Beaufort County) because of the probable damage it will do to Pamlico Sound and the Pungo River. Several years ago the Wildlife Resources Commission fought a plan to dredge for dead oyster shells in Albemarle and Currituck Sounds. The Corps of Army Engineers regularly seeks to block any uses of the estuaries which might interfere with navigation.

A number of coastal counties have adopted subdivision controls and enacted zoning laws in an effort to preserve the estuaries.

But these uncoordinated efforts have not been effective.

One reason is lack of continued, intensive enforcement. Regarding local controls, Hinkley says, "Presently—and I am sorry to report this—there is only one county on the coast that is effectively administering the layout of subdivisions and the zoning of land uses. That is Carteret County."

But the real source of the problem lies in the fact that there is no agency—local, state or federal—which is responsible for the protection of the overall estuarine environment.

"Perhaps most pathetically," Adams says, "no one is in the position to make the necessary policy decisions. No one has the necessary responsibility and authority to do so. As a result,

The natural, useful functions of a marsh are seldom known by the developer, and often simply ignored when they are known in the mad scramble for short-term monetary gains.

PHOTO BY TOM JACKSON

shallow waters are being engulfed, bit by bit, by real estate developers and dredging spoils."

Added to this is a vexing legal problem. Under the law, the state holds title to all land lying beneath navigable waters. It would seem, therefore, that the state has the power to protect these lands. The rub lies in the question, "Just what is navigable water?" Is a tidal creek that will serve a small boat at high tide, but not at low tide, navigable?

The Unaware Public

And there are the additional problems created by instances where individuals have acquired title to estuarine areas through adverse possession. Old deeds based on landmarks that no longer exist raise equally troublesome questions of ownership.

Behind these specific problems there is the fact that the people of North Carolina are largely unaware, and certainly unconcerned. Not even the major conservation organizations in the state—the N. C. Wildlife Federaton, the League of Women Voters of North Carolina [illegible] the preservation of the estuaries a major part of their programs. Like the governmental agencies, they have gone to bat in specific cases—the federation's fight against dredging for dead oyster shell is an example—but they have not tackled the over-all problem, and, seemingly, are not aware of its gravity.

This may be changing.

Recently Gov. Dan Moore set up a Council of Natural Resources. On it are represented all state agencies involved in the use of North Carolina's natural resources.

The council's first action was to name a study committee headed by Adams to analyze North Carolina's estuarine problem and to propose a program for meeting that problem.

Possible Approach

While this study group has made no decisions it is known that Adams presently favors the following approach:

1. Designate one state agency as responsible for the protection agency with the authority to enforce its decisions. Adams says, "The issue here is not one use or the other applied to the entire system but, instead, each use in its proper place and all in proper perspective."

2. As a first step, this agency should make an inventory of the estuarine marshes and water, cataloguing them as to types, ownership, development potential and natural resource value. (An enormous task because more than two million acres of land and water are involved.)

3. Undertake an acquisition program which will bring under state ownership those marshlands of prime importance as nursery areas for food and sport fish. (As a rough estimate, Adams thinks the acquisition program would cost approximately $18 million in state and matching federal funds.)

These are ambitious, costly recommendations. They reflect the seriousness with which state experts view the estuarine problem and the need to meet the problem immediately. ◆

To those who have never known the experience of a day on the marsh, the value of these wetlands seems remote indeed. Yet here is a resource harboring great wealth and once gone, is lost forever. Will the tide of development stop?

PHOTO BY JACK DERMID

Even the surf angler and charterboat fisherman benefit from the marshes. These tidal waters provide nursery areas for many salt water fishes, as well as being the food-producing sites for these fish.

PHOTOS BY TOM JACKSON

Multiple Use of Salt Marsh Impoundments

by Otto Flors[illegible], Jr.,
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LESS than ten years ago, many thousands of acres of North Carolina's salt marshes were being threatened by mosquito drainage. These outer lower marshes consisted mainly of needlerush while the higher areas contained vast stands of sawgrass or "cuttin' sedge." In these habitats and in salt meadows interspersed throughout them, millions of mosquitoes hatched throughout the year during warm periods and then migrated to populated areas with the aid of coastal winds.

At about that time the State Board of Health and a few county health departments became expressly concerned with this problem. Man, having more and more leisure time, came to these coastal areas to hunt and fish, swim, boat and just plain relax. Of course, hordes of salt marsh mosquitoes descended upon him and limited his recreational activities. With these conditions there was born in coastal North Carolina a wholesale onslaught on the salt marsh mosquito.

Prior to this time major methods of control involved insecticides. But this was impractical in the far removed non-urban areas of the coastal plain, the birthplace of the salt marsh mosquito. Adulticides gave some relief in towns and cities, but without attacking the cause of the problem the battle was long, tedious and expensive. So wholesale permanent control of salt marsh mosquitoes at their breeding and hatching sites evolved. Traps attractive to adult mosquitoes showed that they laid their eggs on the damp non-flooded marshes and then only under certain kinds of plants in certain kinds of marshes. Further reading revealed that only after a suitable one to two week curing period and after the marsh became flooded by heavy rains or high tides, did the eggs hatch and the larvae emerge in the water.

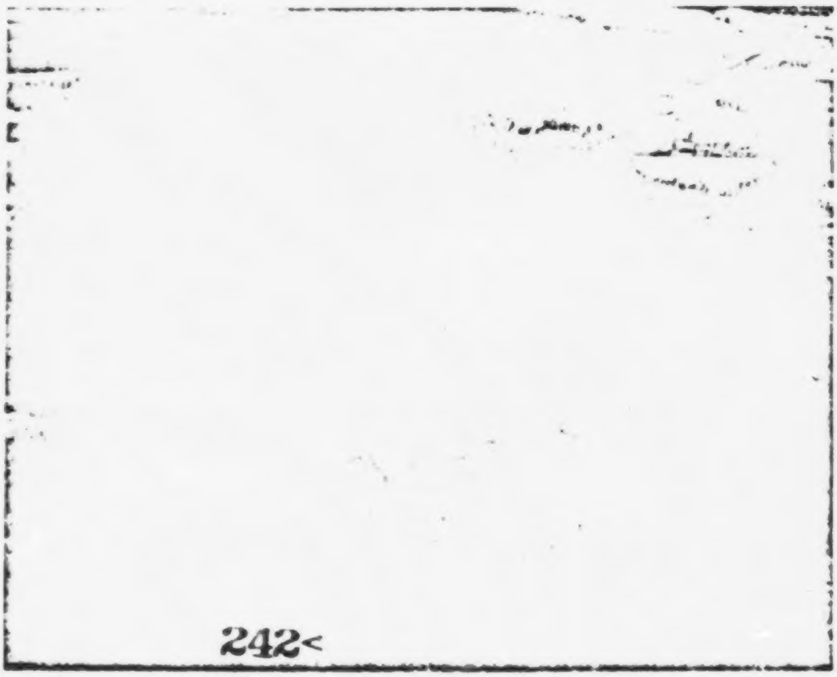
After the water receded, numerous puddles remained in the marsh. In these puddles, cut-off from mosquito-eating fishes and other predators, the larvae progressed through four stages and became pupae. This aquatic form of the mosquito lasted from five to ten days depending on the water temperature. This then was the place to rightfully attack the mosquito—right at his birthplace!

Larvicides were not the control answer for the entire coastal areas because this mosquito-production belt extended from Currituck County on the Virginia border to Brunswick County on the South Carolina line. The very extensiveness of this belt would involve prohibitive costs except in small local areas near population centers. Then too, control was not necessary in all types of salt marshes, but pre-determination of control and non-control areas would be as expensvie as the control itself.

It was learned that properly spaced and interlaced ditches in a marsh would effectively remove these rearing-puddles, usually within the required five to ten days. Pamlico County, under the direction of Sanitarian Charles J. McCotter, purchased a dragline and began North Carolina's first extensive marsh ditching program.

At first this program's results were not clearly evident. As the drained acreage increased however and as another dragline was put into operation, Pamlico

This is the White Oak River waterfowl impoundment near Stella in Onslow County. Note the many drainage ditches which were discontinued in favor of impoundment in center.



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most welcomed results. A third dragline was purchased by Pamlico County. County Health Departments in Onslow and Carteret counties, upon hearing and studying these reports, purchased draglines and began marsh-ditching programs also.

About this time, we in wildlife became a little concerned with the marsh drainage program. While we were glad that the wholesale use of dangerous insecticidal chemicals was being discouraged, we were concerned about the possibility of upsetting nature's wildlife resources in the marshlands. For example, we knew that these salt marshes in their natural state are the nursery grounds for literally tons of minute food organisms which are essential for the well being of wildlife, fish and shellfish.

We were not sure whether widespread ditching would disrupt this delicate balance and thereby affect a certain community of wildlife—be it a game species or some other forms of wildlife. We were familiar with the ever-increasing decline of natural salt marshes up and down the entire Atlantic coast and its life. We [illegible] on northern coastal salt marshes where mosquito ditches lowered water tables so severely in some marshes that nearly all of the marsh vegetation was eliminated and replaced by higher-land plants. Of course with this ecological change in plant composition, there was an accompanying change in animal life, often to the detriment of preferred species. We knew of a few cases in North Carolina where the ditches drained marsh potholes to the point where submerged duck foods were eliminated and duck usage declined.

We want to point out that the North Carolina Wildlife Resources Commission is not against mosquito control. We are not putting wildlife over man's comfort. We are merely concerned over any large scale destruction of habitat which may possibly affect environments necessary for the sustaining of wildlife species. We are dedicated to the "users" of wildlife as well as to the wildlife itself.

Due to the broad-mindedness of North Carolina's mosquito-control officials on both the state [illegible] able to preserve and enhance a portion of our salt marshes for wetland-using wildlife. This has been brought about by the construction of salt marsh impoundments. In 1962, the first of four such impoundments was completed in Pamlico County. Here a 35-acre pilot project was established. Since then 1200 additional acres of impoundments have been constructed on Commission lands for the public use and 2000 acres have been constructed on private land.

While the costs of impounding are approximately one-third higher than ditching, the benefits are many times greater. The results of ditching are primarily for salt marsh mosquito control. Impoundment results have included a number of planned and unforeseen benefits. These include the following:

Mosquito Control — Post - impoundment tests for salt marsh mosquito larvae show a 100 percent control after initial flooding. By holding constant water levels throughout the year in a salt marsh impoundment, the egg-laying sites for adult mosquitoes are for the most part eliminated. Permanent water levels sustain a mosquito-eating fish population to afford further control.

Waterfowl Use—Pre- and post-impoundment inspections show that good waterfowl habitat has been increased from less than five acres to over 1200 acres in connection with the impoundment on state-owned lands. By providing year around food, water and cover, waterfowl use has included over 18 species of ducks, Canada and snow geese, whistling swans, coots and mergansers. These include overwintering, migratory and nesting populations. Duck species observed nesting in the impoundments include black ducks, wood ducks, blue-winged teals, ruddy ducks and gadwalls. Over 85 known broods have been observed on the 1235 acres of impounded salt marshes since 1962. Up to 6000 waterfowl have been observed on the impoundments in a single census.

This is a "hub" area of the Pamlico Point waterfowl impoundment showing the pump houses, dikes, and water level control gates. Impoundments of this type offer multiple use.

Waterfowl Hunting—Last season in the four Commission salt marsh impoundments, approximately 1200 ducks, coots and geese were harvested in 600 hunter-days of use. Since 1962 about 2000 waterfowl have been bagged in 1200 hunter-days. Prior to impounding, very little hunting occurred due to the inaccessibility of the few natural pot-holes.

Other Wildlife Use—Since impounding, several groups of bird watchers and other interested persons have taken advantage of the aesthetic values offered. Other game species which have become users include Wilson's snipe, gallinules, Virginia clapper and sora rails, and mourning doves on the dikes. Other species of birds, although not game species, are present in abundance at times and include willets, great and little blue herons, Louisiana and little green herons, American and snowy egrets, yellowlegs, several species of sandpipers, American and least bitterns, grebes, gulls, terns, glossy ibises and various hawks. Nesting species observed include least bitterns, three species of rails, grebes, gallinules and terns.

Furbearer Trapping—A few of the major unforeseen users of the salt marsh impoundments have been otters, mink, muskrats, and raccoons. In addition bobcat and fox sign has been observed. As a result trapping has been encouraged and proven beneficial to some persons. Annually, the catch on one impoundment has exceeded 100 muskrats, 10 otters, 30 mink and a few raccoons. In another area, over 200 muskrats were caught in a single season in addition to six otters, 25 mink, and 25 raccoons.

Fishing—Another unplanned benefit occuring in the salt marsh impoundments has been fishing. One area has had fair pumpkinseed fishing for five years under consistant pressure. This same impoundment also has some surprising bass fishing at times and yielded a five pounder in 1966. Another area has a very high population of one- to two-pound mullets, has had spots in the past and this year offered excellent pumpkinseed fishing, some up to eight and one-half inches in length. It was estimated that over 500 man-days were spent fishing on this area during March and April, 1967. All the impoundments have high mullet and catfish populations and are stocked annually with largemouth bass fingerlings.

Although the impoundments are not managed specifically for furbearers, marsh and water mammals such as this mink, are harvested regularly as an added bonus.

Crabbing—For an unexplained reason, hundreds of blue crabs have been observed in all the impoundments. Visitors to the areas have taken bushels of these home. The crabs are abundant impoundment-users during the first few years but evidently do not reproduce inside the impoundment and become less common in later years. Occasionally, one is still seen in the older impoundments.

Frogging—Reports from one of the older impoundments indicate that eventually they may turn into bullfrog harvest areas. While this is not a dominant sport in North Carolina wildlife circles, participants of this sport rarely tell their "trade" secrets. Whether fly-fishing, gigging or shooting for bullfrogs, the sport is enjoyable, the eating delicious.

Firebreaks — There has been some complaint that a network of ditches through a marsh does limit access to all portions of that marsh. The ditches, usually six to nine feet in width and three feet deep do prevent free marsh travel without the use of bridges. This could be extremely critical in fire fighting. On the other hand the strategic placement of permanent water impoundments does reduce the chance of fire encroachment while at the same time permitting increased access by dike travel.

We have attempted to list here some additional benefits of long-term permanent mosquito control through the use of impoundments. We feel that these areas more than pay their way by furnishing not only mosquito control and improved wildlife habitat but by providing both local and migrant sportsmen places to hunt, fish, trap, frog, crab and observe wildlife in near-natural conditions. There may be a day fast approaching when we wish we could have retained more of nature in her natural condition rather than to let her be ravaged by man. Thanks to some far-sighted mosquito-control workers in North Carolina, at least part of this loss is being replaced in coastal areas.

There is now reason to believe that this same mosquito control technique may be possible in inland freshwater swamps. While we will be fighting a completely different group of mosquitoes, including some capable of carrying malaria, new research in this direction is now being started with representatives of the State Board of Health and the Wildlife Resources Commission. After extensive experimentation, we hope to gain the knowledge necessary to offset the thousands of acres of wetlands losses we are currently experiencing throughout the state in swamp and bottomland drainage projects. Perhaps here too we can, with a little foresight, provide for one or more resources while at the same time working toward the control of a common enemy of man. ◆

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Natural Resources and the Expansionist Philosophy

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PART I

Presented at the Annual Conference, American Association for Conservation Information, Empress Hotel, Victoria, British Columbia 12 June 1967.

ANY attempt to appraise the future condition of mankind involves, at first thought, an appalling temerity. The assignment seems to require an impossible resolution of biological, sociological, and economic factors. Probably it is true that no one can look ahead fifty years and do this job in any detail.

If we could manage it, there would be ready application for the facts. On every side we face decisions that concern the allocation of resources, the quality of our environment, and service to human need, now and forevermore. This is a classic sins-of-the-fathers situation in which our heirs will bless our wisdom, and our mistakes will find an unwelcome roost on their doorstep.

Despite the difficulties, we must invoke what foresight we can in resource use, and in terms of major issues I think we have much to work with. Our context is the field of human, or resource, ecology. This is a developing scientific discipline concerned with relationships of humanity to the total environment. Characteristically, it involves synthesis and generalization. Inevitably it includes conceptual trial and error.

The ecologist is aware of his limitations, but he is learning to distinguish rights from wrongs. I suspect he knows considerably more now than anyone can apply. If this is true, then a weak link in our resource management effort is the information function that should be telling the customers what they need to know. Information people strive with great diligence to sell the conservation idea. But it probably is good for anyone to have an occasional review of premises and a more critical focus on the issues.

To put first things first, what is the objective of our concern with the resource environment? What would we have for mankind now and in the future?

I suppose the only reasonable answer is this: We are after the best possible living standard for every individual. Such a statement identifies a worthy goal but does not define it. How could anyone describe an idealized life pattern for the future? This involves personal attitudes, and for each of us standards are likely to change with time. For my part, I cannot accept a common viewpoint: I doubt that the output and consumption of material goods is a satisfactory measure of living standard. It is part of our well-being, but there probably are more fundamental things. Surely, good health is the greatest beneficence that modern science has to offer. No doubt a quality existence includes being well fed, well clothed, and well housed; but space and pleasant surroundings must also be high on the list. In social terms, we take for granted all the freedoms that are a part of human dignity. Freedom from work is not one of these.

As proprietors of North America, we have custody of a great freehold. How we handle it will identify us in times ahead. Probably the most exacting demands on our skill and conscience are in dealing with replaceable natural assets, those that can be improved in use through biological process—soils, waters, forests, ranges, wildlife, and scenic beauties.

Historically, the management of renewable resources has been a threshhold of frustration and delay. Accomplisments, often good in themselves, fitted only by chance into any reliable outlook for tomorrow. There has seemed to be no plan at work, nor even a comforting philosophy.

Principles and basics

Resource problems are characteristically a national concern. At local level they frequently are obscured and fragmented by provincial attitudes and personalized political relationships. It seems right to expect of any government that it consider responsibly the needs of the whole public and use our unmatched technology to plan ahead for human welfare. Surely a century hence is not beyond our limits of responsibility.

Assuming that there is a science of environmental relationships, how does it go about its problem solving? Probably you could not get the same answer from any two people. However, I think there are basic aspects of the population-resources equation on which many thoughtful persons could agree:

First, we are dealing with a strictly limited quantity, the finite earth, its space and raw materials.

To this we apply our atom-age

[illegible] capable of bewildering complexity that includes our industry, science, and all we do to make resources useful.

Another variable is the number of people who divide the benefits, today's steeply ascending curve of population.

Finally, a living standard is resolved from relationships of the other three. The concept can be represented this way:

Resources X Culture
Population = Living Standard

I have used this formula frequently, and I come back to it because it seems to wrap up in a package the proximate and ultimate resource problems of our kind. We need any basic framework that can help to organize our thinking in this field.

It is common knowledge that over half the earth's inhabitatnts are perpetually hungry, and that on this continent we have the highest living standard of any major area. The relationships I have cited are inherent in some calculations by sociologist Philip M. Hauser, of the University of Chicago. Hauser states that all the goods and services now available in the world would support about half a billion people at our level of living. Yet the total population of this planet now numbers 3.4 billions!

Since the resource professional is trying to raise living standards, and since he is working with [illegible] raw materials are fixed, it behooves him to consider how many people he is trying to serve. He must be concerned with what is happening to human numbers.

Gross trends of this kind are illustrated by some figures the United Nations published several years ago: In 1700, the earth's population was growing at such a rate that it would double in 178 years. By 1800, the gain had stepped up a bit; numbers were doubling in 154 years. In 1875 the rate was 98 years, and in 1960 it had declined to 41 years. If the trend continues, by the year 2000, the people of the earth will be doubling their number in 23 years.

Obviously this is geometric expansion, and exponential curve, numbers building at compound interest. The biologist recognizes it as the kind of increase expected in any animal population that invades an unoccupied area or finds access to a new resource base. In North America we have done both. The continuing availability of usable resources is primarily a result of today's burgeoning technology. In addition, we are hard at it, draining, irrigating, filling, cutting, bulldozing—making huge investments to "develop" and populate the blank spaces on our map.

That the demographic results [illegible] preciated was impressed on me vividly several years ago. A group of resource specialists were standing on Hoover Dam, looking down into the partially filled reservoir that is Lake Meade. In response to a philosophical question, a civil engineer who was our guide said this:

"With the population of this country doubling in 35 years, don't we have to keep ahead of the game and see that what those people will need is ready for them? Here in the Southwest that means making available every acre-foot of water that can be stored for use. I think we can't fall down on this one almost regardless of what it costs."

A voice in the rear took issue with him. "You're leaving out something important. Because every time you carry out one of these big developments, with each new acre you irrigate and make habitable, you are adding to the total population and to the demand it will make on all resources. You are developing a bigger problem that will take more billions in public money on the next go-around!"

Strangely enough, this relationship of the population to the resource base is sometimes denied — which seems something like a claim that two human beings can occupy the same space at the same time.

Is there a limit to the exploitation that natural resources will take before becoming a liability rather than an asset? Have we reached that point?

PHOTO BY TOM JACKSON

[illegible] cultural [illegible] have been influential around the world. Most significant are those in medical science. We know that birth rates may vary regionally and periodically, but the overshadowing cause of population increase has been the decline in death rates. A single discovery—the use of DDT to control the insect vectors of typhus and malaria—brought about a spectacular population build-up in the tropics after 1945. Nearly all our help to "have-not" nations has contributed to their population problems.

We are keeping people alive, even if we cannot feed them or make them comfortable. Last year there were about 125 million births, and roughly 60 million deaths. This is a worldwide gain of 65 million people—or is it a gain?

The natural man

In natural communities of living things, there are automatic checks on the numbers of any species. These controls may operate with some lag, but they are effective. It is said of most mortality factors that they are "density dependent," a characteristic that is evident as we watch the ills develop in high populations of animals — food depletion, the spread of disease, fighting and social breakdown, pollution of the habitat. Various causes of mortality interact and may be mutually reenforced. The most basic and predisposing factor is social stress itself, which tends to increase as the square of the population.

One of the rapidly growing fields of biological endeavor is that of animal behavior. Such studies are richly rewarding in revealing the key to many ecological adjustments. Individuals in a population are organized and socialized according to patterns fixed in the germ plasm quite as realistically as are structural features. Orderly social relationships are a means of spacing individuals and dividing up the habitat for efficient use. They are a mechanism for mitigating strife within a species and holding competition to useful levels.

[illegible] survival value.

Possibly some will claim that man is an entirely different kind of being, largely immune to biological controls. This is implicit in our common attitude toward population and the economic system. Particularly here in North America, we appear to be embarked on a policy of more and more of everything from now on. Every small town wants to be a big city, and every chamber of commerce is dedicated to bringing in more customers, attracting more industry, getting more land taxed for more dollars, and developing every natural asset for more business.

This outlook, of course, originated from the unquestioned fact that these activities built the strength of our nations. Part and parcel of the expanding economy has been the expanding population, acted upon by an elaborating technology. Economists commonly take a short-term view in their recommendations to promote growth in business activity and an annual increase in Gross National Product. This, of course, is what every office holder requires during his own tour of duty.

The result is a general assumption that expansion is forever, and that science will provide the material means of outrunning the increase of human numbers. In 1965 a survey for the Population Council of New York showed that barely more than half of U. S. citizens feel any real concern about the nation's population growth. Their complacency feeds, no doubt, on daily exposure to the outlook for "progress"—food from the oceans, which could nourish billions of hot-house humans; the desalination of sea water to turn every desert into cropfields; the industrialization of all "backward" areas via unlimited nuclear energy. Orthodox specialists and purblind writers commonly issue their stirring forecasts in terms of the vast numbers of people that can be served. This thinking could lead to the epic folly of our time.

The truth is that nothing expands forever, and that continu[illegible] strength in our [illegible] society will depend on a new outlook. Attitudes that seemed to work in our earlier history no longer apply in a well-populated continent.

Ahead, we may confide, is a time when social and political progress will catch up with and direct our applications of biological and physical science. By intelligent choice we will have an optimum world population living on a pay-as-you-go regime of resource use. This somewhat visionary prospect has, in reality, no respectable alternative. Professional endeavors in every applicable discipline need to get oriented toward such a goal. The time is now because exponential curves wait for no man, and *habitat degradation is in many cases irreversible.*

In the seethe of overgrown cities we see abundant evidence of biological disruption. The signs are social, psychological, physiological, pathological. Increasing crime rates, the befuddlement of youth, soaring costs of government, the growth of every kind of insurance and welfare plan—a basic ecological response is suggested in all these trends. They bespeak a social adaptation syndrome quickened by population stress.

Overcrowded man must be specialized, organized, controlled, and protected from his fellow men. He gets little gentling in a worn and soiled environment. He seems more content and thrifty when having access to variety and distance, even silence and solitude. The mass production of anything—even human beings — means standardization. There was respect for his own kind in Robert Frost's statement, "I'm against a homogenized society because I want the cream to rise."

Numbers and habitat

It is unthinkable that we should fail to cope with the population problem in decades ahead. Our only approach is through the birth rate—it must be effectively reduced over most of the world, as we continue to promote good health and prolong life among all peoples. There is reassuring evidence that once a high level of education and material prosperity is attained, a lowering of the birth rate will be automatic. Hence, such accomplishments will be, in a measure, self-perpetuating.

Today's challenge is to make known at home and abroad the overriding urgency of what must be done. A few far-sighted people have fought on this front for several decades. They deserve an uprising of support that can originate only in North America.

If a downward trend in population could be achieved, the imperative demands of our proliferating economy should ease. This need not be a disaster in any sense. Economists are becoming increasingly interested in the mechanisms that such a situation would involve. Economist - demographer Joseph J. Spengler of Duke University points out that favorable economic trends are not dependent on steadily increasing numbers of people. In effect, a limited population could stimulate demands for goods and services almost indefinitely through better living. Spengler ended an address to the Industrial Conference Board in New York this way:

"In the future, economic growth will depend mainly upon invention, innovation, technical progress . . . Population growth will probably play an even smaller role than I have assigned it in earlier discussion. It is high time, therefore, that businessmen cease looking upon the stork as a bird of good omen."

It goes almost without saying that the best anyone can possibly do in damping the population boom will not be soon enough. In the meantime a line is to be held: there is a program of quality control to be applied with judgment and courage to the human environment. In North America we have great possessions that will cost us little to keep but much to lose.

The most perishable amenities of this world are its open spaces and quietudes, its greenery, pure waters, natural rivers, wetlands, life, and choice scenery, its dwindling modicum of true wilderness. Substantially, these are what President Johnson has characterized as "natural beauty." Nationally they are the out-of-doors we use for recreation. Locally they may be the charm of a pleasant countryside or well-groomed city.

Since pioneer times this landscaping has graced our inherited estate as a luxury we could afford. Its dollar value is difficult to pin down. It is vulnerable to attrition by piecemeal decisions, which assume that a little more of one thing or a little less of another won't really matter.

This public attitude is an honest one. Our leadership in resource affairs is largely a thin line of mercenaries, where there should be backing in depth by citizen volunteers. Most of today's universities are centers of technology, rather than philosophical thought. The vast majority of young people go through school with no exposure to the biological realities of human existence or the natural world. They assume the duties of citizenship with little understanding or feel for the order among living things—a necessary basis for workable attitudes toward human and resource husbandry.

Holding or salvaging the most fragile values in our environment has become an emergency issue —first in time because the headlong impetus of our make-work enterprise has no built-in controls. Our history and success have fostered a certain arrogance toward the native wilderness of our homeland. North Americans are commonly so bemused with the charm of bringing straight lines and square corners to the chaos of nature—our bulldozerkampf—that they have no idea where it should stop. Among choices to be made, it seems essential to dissipate our wasteful momentum in doing more of everything we know how to do, useful or not. In the resolution of values, man's mastery of the earth will pay him greatest tribute when he achieves the forbearance to leave some of it alone.

The essence of resource planning is to identify investments of lasting worth. Important strategy probably is to look skeptically at great public projects calculated to change the face of the land, replumb river systems, and make new areas "productive." Large water projects are notoriously destructive of flora and fauna and the natural scene. They require our grandest gorges and pristine rivers, the winter range of big game, the drowning of geological and archaeological treasures, the loss of recreational open space.

A common motive in impounding waters is flood control. Yet the temporary nature of such benefits on silt-laden streams is seldom recognized. As reservoirs fill with sediment, their storage capacity is lost. In the floodplain below a dam, temporary protection from overflow encourages a build-up of structures and settlement. What problems are being created for solution at public expense when spring runoff can no longer be contained in the silted-up reservoir? Hopefully, the Water Resources Planning Act of 1965 can bring a more long-range appraisal to bear on projects of this kind.

One may say realistically that the bulk of good resource management is not so much in costly works as in avoiding mistakes. Much of today's necessary investment is for overdue clean-up of pollution and repair of damage—a situation that should change as our estate becomes more orderly.

concluded next month.

PHOTO BY FRED FISH

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CONCLUSION

Presented at the Annual Conference, American Association for Conservation Information, Empress Hotel, Victoria, British Columbia 12 June 1967.

Policy and progress

• It might logically be assumed that the doctrine of conservation would be sufficient guide in the management of our natural wealth, and perhaps it should be. More than sixty years have gone by since chief forester Gifford Pinchot and his colleagues developed this idea with the encouragement of President Theodore Roosevelt. They said it was to be a new government policy providing for ". . . use of the natural resources for the greatest good of the greatest number for the longest time."

The good of the majority and the longest time—this viewpoint assigns our generation a limited equity in resource property. It says that people of the future have a right to use what we leave, and thereby our children many times removed should have a share in critical decisions. They will be at least as well qualified as we are to dam the Grand Canyon, cut old-growth redwoods, and subdivide the last seashore.

It was the short-range view that stirred Pinchot and Roosevelt. They saw the sackage of a continent taking place under an assumption that everything belongs to the first-comer. The pelf of the land was being burgled off, with profits-in-our-time the only criterion of success. We know now that some of those early gains were borowed from capital, with the debt left to a later generation. We ourselves have made payments on this account in reclaiming damaged lands and sickened waters.

The first decade of this century is recognizable as the period of changeover to a new outlook and a new morality in the management of national assets. It was also a notable action period. In the face of bitter opposition, Roosevelt set aside many areas from the public domain for use as forests, parks, and wildlife refuges.

The conservation idea caught on as a principle and slogan. Semantics became much involved in its ideology. For half a century we have argued about the difference between exploitation and development. One is bad and the other good, by someone's definition. In our latter-day sophistication, almost any opertaion may be labeled righteously as conservation. The farther we get from the Pinchot-Roosevelt era, the easier it is to say that, after all, conservation means different things to different people.

History is witness that major accomplishments in the natural resources field have depended in gross disproportion on the inspiration of a few. Great works have not been the option of political parties, but of men whose common ground was a feeling for their own kinship to the earth. Through the years, there have been such people in government and in citizen organizations. We have made fitful progress toward national controls—even international efforts, as in our migratory bird regulations.

The presidency of Franklin D. Roosevelt was our second period of great concern and action on behalf of responsible resource use. During the thirties, Roosevelt brought men like Ding Darling and Hugh Bennett to Washington and gave them encouragement to do their jobs. An economic crisis demanded new adventures in public works. A devastating drought brought home to all the plight of ailing soils and watersheds, improverished wildlife, mistreated grasslands and forests.

Congress and the president acted, and the public approved. But the technology of the day was found wanting. The ecology of living resources was little understood; needed facts and techniques were not to be had. Largely on a trial and error basis, management projects muddled ahead.

What Pinchot had perceived thirty years before was now evident to many—that we have continuing incentive to study and improve the soils, forests, grasslands, waters, commercial fish, and other sources of supply for our industrial brawn. Of course, something similar can be said for making best use of non-replaceable wealth.

The great awakening of the thirties was lost in a world of conflict, and thereafter it recovered only briefly before the budgetary competition of the cold war caught up. During the forties and fifties, despite inadequate support, resource management technology made progress in our governments, in states and provinces, and in educational institutions. Local and national conservation organizations continued to build their memberships, and public awareness of important problems showed steady gain.

In the United States, the Outdoor Recreation Resources Review Commission was created in 1958. It submitted its epochal report to the President and Congress in 1962. In its philosophical tenets the report suggested that, "Leisure is the blessing and could

PHOTO BY JACK DERMID

One of the problems facing conservationists is how to furnish quality sport to the growing army of fishermen and hunters with a fixed quantity of land and water.

be the curse of a progressive, successful civilization." And again that, "The fact that we live in a world that moves crisis by crisis does not make a growing interest in outdoor activities frivolous, or ample provision for them unworthy of the Nation's concern."

Overnight, recreation acquired a new social dignity, and outdoor values a new economic status. The historic document detailed the problems of preserving, developing, and using leisure-time resources. It proposed the best plan anyone had seen for much that should be done.

New light on population

The most significant happening of the past twenty years has been the emergence of the population issue into full high-level acknowledgement. For long the going was hard; but able technical leadership, crusading citizens, and growing editoral confidence brought it off.

The portent of a changing attitude in government came in 1961. In March, following his inauguration, President Kennedy made it clear that he understood the problem and favored its open discussion. Thereafter, administrators and legislators referred to it frequently. In 1962, an unprecedented resolution passed in the General Assembly of the United Nations. It called for cooperation by nations in population planning.

Demographers regard 1963 as the break-through. That year saw the first of two influential population reports by the National Academy of Sciences — National Research Council. Congress passed a foreign aid bill including funds that could be used for research on problems of population growth. A new liberty in discussing this subject was openly proclaimed in the Senate.

On January 4, 1965, in his State of the Union Message, President Johnson declared a policy of far-reaching significance: "I will seek new ways to use our knowledge to help deal with the explosion of world population and the growing scarcity of world resources." This statement was the basis of administrative communications to embassies and all missions of the Agency for International Development.

In his speech commemorating the twentieth anniversary of the United Nations, the President made a forceful appeal to the world:

"Let us in all our lands, including this land, face forthrightly the multiplying problems of our multiplying populations and seek the answers to this most profound challenge to the future of the world. Let us act on the fact that less than five dollars invested in population control is worth a hundred dollars invested in economic growth."

This statement defined the issue clearly. It committed the United States Government to domestic action and world cooperation. As a new departure in the quest of mankind for peace, decency, and the abundant life, there is little question that it ranks with the founding of the conservation concept itself in 1907.

Threshold of the future

The way is opening ahead, but the vast bulk of humanity is not informed. In fact, on this continent the best educated people in the world are bumbling ahead under an expanding economy slogan that still largely ignores space values, fails to distinguish between quantity and quality, and regards overflowing masses of human beings as a consumer base essential to "prosperity." We still have the hang-on attitude toward land that the "highest use" for any acre is to make it yield dollar tribute in the form of something that can be used up and replaced.

This is our wastrel era, which people of the future are unlikely to admire. On a different plane, and under a different rationale, it is as much a me-first, dollars-for-today program as was that of the exploiters in the late 19th century. We have conned ourselves into a state of mind whereby it is popular to dignify the "user" and deride the "preservationist." It seems a doubtful hazard that too much of anything is going to be preserved, but many things could easily be over-used.

Economic projections by Joseph L. Fisher and Neal Potter of Resources for the Future are commonly accepted as essentially favorable. These indicate that the predicted doubling of population by the year 2000 will not be accompanied by major shortages of material goods in North America. As for the world, these authors " . . venture the view that living levels in most countries can increase over the coming years, with diets improving slowly and energy and mineral use more rapidly. The process depends heavily on education, motivation, favorable government policies, and social adaptations."

The importance of the latter qualifications is evident when we der a statement by the Food and Agriculutre Organization of the United Nations in the Third World Food Survey of 1963. "By 1975 world food supplies would need to be increased by over 35% merely to sustain the world's population at its present unsatisfactory level of diet."

Raymond Ewell, Vice-President for Research at the State University of New York, says that if present trends continue, mass starvation can be expected in several far-eastern countries by the early 1970's and that it will be widespread over Asia, Africa, and Latin America by 1980.

It is evident that there are grave hazards on the one hand and possibilities for great technological progress on the other. It should be remembered that the projections previously referred to are for "resources and raw materials," and that supplying the world as they suggest would require what amounts to an international pooling of capital and natural assets. It would entail the total mobilization of science and the intensve development of all lands and waters for maximum yield of subsistence products.

What such a program would do to this earth as a quality habitat can only be left to the imagination. And if we actually could work [illegible] to the year 2000 by such heroic measures, what then? Does anyone think the process might be repeated from the new population level?

In our forecasting and analyses we give great emphasis to material goods and dollar values—things we know how to measure. One wonders if it really is asking too much for us of the present generation to share the enlightenment of John Stuart Mill in 1848: "A population may be too crowded, though all be amply supplied with food and raiment. It is not good for man to be kept perforce at all times in the presence of his species."

Inevitably we come back to the proposition that in man's future there is to be an ecosystem whose basic relationships will resemble those in the natural world. In our world too, the healthy developments will be toward stability—a state in which input equals output. It is evident that we are going to have population control. The question is how soon, and how much we will have left to work with when it becomes effective. Our science can rise to its potential as the boon and salvation of mankind only when the frantic demands of the population emergency are abated.

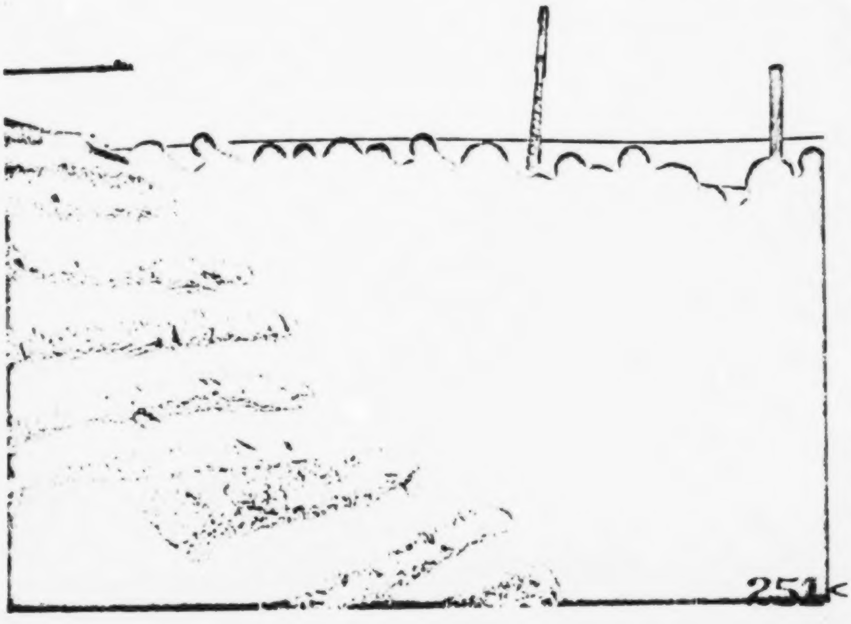
As a general guideline, if we are able to muster the control to preserve and improve in reasonable degree the esthetic features and recreational open space of this continent, it is likely that many other aspects of the resource management program will fall into place. As a critical reality, any major accomplishment of this kind will require support by millions of informed citizens; and on that score, the difficulties are increasing.

In reflecting on his mission, Secretary of the Interior Stewart Udall expressed the qualms of an outdoorsman: "We have developed a whole new generation of sedentary, city-bound citizens, wheedled by spectatorship and the air-conditioned advantages of glassed-in living into acquiescing to the diminution of the spaciousness, the freshness, the green splendor of the American earth."

This is indeed a basic jeopardy in efforts to preserve and restore the quality and variety in our habitat. The prime obstacle of decades past, a stonewall of disregard, could easily become the roadblock of complete unfamiliarity.

We have a vital problem of communication. People must be kept in touch with the out-of-doors and conscious of their privileges as owners of it. Our up-to-date conservation story tells of human numbers, quality living, quantities of resources. It describes how we monitor our status and progress by careful inspection of our range. The story will have to be told by spokesmen who know whereof they speak. I have no doubt that all of us who take on this critical information job can be most effective if we hold ourselves keenly aware of a fateful mission—that the message concerns the greatest challenge with which mankind has yet had to deal. ◆

PHOTO BY JOEL ARRINGTON



Competition for our Nation's natural resources is keen. Industry and sportsmen may want the same resource or the land which produces this resource. Careful planning will help get maximum multiple use from these resources.

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Our Changing Environment—

Some Reflections on the Dark Side of "Progress"

by James C. Wallace

AS we enter upon the last third of the Twentieth Century it can be predicted with confidence that a new wave of optimistic forecasts concerning the future will soon be upon us.

"Man on the Moon by 1970. On Mars before 2000."

"A Gross National Product of $850,000,000,000 by 1970."

"A Population of 400,000,000 by 2000."

"Double the *per capita* income by 1990."

"Feed the World through America's Miracle Agriculture."

Such statements as these have already been made by various "experts," and we can expect to hear still more of them in the coming years. All the statements have two things in common: they assume an endless, upward progression in Human Affairs through the utilization of Technology, and they affirm, to borrow the motto of a well-known company, that "Progress is our most important product."

But there is another, a much darker side to this shiny coin. It is a side which is not usually discussed by the partisans of blind "Progress," and if it is mentioned at all, it is usually dismissed as being just another problem which will be solved in the course of time. I refer to the destruction of our environment, a destruction planetary in scope, which is now taking place. The senseless waste of resources, the fouling of air and water, the ugly and primitive rape of the countryside: these are the real—and fateful—costs of our highly advertised "Progress." And, unless we turn our total attention to these costs, unless we alter our approach and our direction, and unless these things are done soon, it is clear that the "Progress" about which we so proudly speak will shortly come to an end.

Is this another Jeremiah talking? Or, perhaps, a Cassandra? The answer is "no" to both questions. Rather, it is a person who is impressed by facts and figures of the very hardest, most scientific kind. Let us consider some of those facts:

- We are dumping over 140,000,000 tons of pollutants into the American atmosphere each year.
- We dump 2.5 billion pounds of garbage in the United States each year. This is 1,600 pounds per person.
- The garbage includes at least 48 billion cans, or 250 per person.
- 26 billion bottles and 25 million tons of waste paper are piled up every year.
- About 1,940 cities in the United States have combined sewers, carrying both raw sewage and rain water, which serve about 59,000,000 people. These sewers flush about 65 billion gallons of raw sewage annually into the nation's watercourses.
- The great bald eagle, symbol of the United States, is becoming sterile. He is a victim of eating game and fish which contain traces of DDT. The blue shell crab might well become extinct because of similar contamination.
- North Carolina is importing oysters from Louisiana! Our oyster, clam and scallop business is being critically damaged by a combination of pollution, dredging, channelization and spraying.
- Along the banks of the Colorado lie snow-white dunes, many of them weighing millions of tons, which are piles of uranium tailings left over after the U-235 had been processed out of the ore. These wastes contain radium-226, with a half-life of 1,600 years, and thorium-230, with a half-life of 80,000 years. As the piles erode, the radioactive materials enter the river and move down-stream. In the Lake Powell and Lake Mead reservoirs concentrations of radium-226 have been detected, concentrations in excess of maximum permissible levels.
- The Great Lakes constitute a large percentage of the world's entire fresh water supply. Lake Erie, the shallowest of the lakes, is nearing its biological death. Only a chemical tank will be left unless massive efforts are soon made to save it. Detroit alone pours hundreds of millions of gallons of waste each day into the Detroit River which flows directly into Lake Erie. The Cuyahoga River, flowing through Akron and Cleveland, and then emptying

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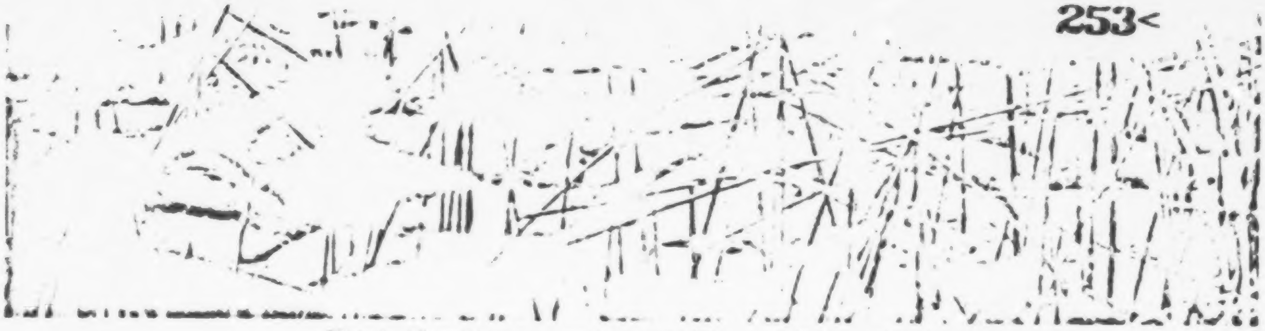
For many detailed examples of environmental pollution, see "Restoring the Quality of Our Environment." (Washington, D. C.: Government Printing Office, November, 1965). Also see "Science and Survival" (Viking, 1966), by Barry Commoner, a well-known biologist, for several of the cases mentioned in this article.



Man is often his own worst enemy. Misuse of Nature almost always results in an ultimately poorer mankind.

into the Lake, is so clogged with debris—old tires, flammable chemicals, logs and rotting pilings,—that it has been labeled a fire hazard! Some 87 tons of phosphates are dumped into the Lake each day, serving to produce thousands of tons of slime, green and blue-green algae which, in decaying, deprive the water of its dissolved oxygen Last year, 2,600 square miles of the Lake—over one-fourth its area—had been largely deoxygenated.

- At the foot of Niagara Falls, when viewed from the bridge frequented by honeymooners, dark eddies of brown, stinking sludge can be seen.
- When the Welland Canal, by-passing the Falls, was cut in 1932, the object in view was the facilitation of shipping, all the way from the Atlantic to Duluth. The Canal also facilitated the entry of the parasitic sea lamprey into the Lakes. The lamprey has now spread throughout the Lakes and has destroyed large quantities of the desirable fish. (The lamprey attaches itself to a trout, bores a hole into it and sucks out its body juices.)
- It is estimated that it will require at least $100,000,000,000 to clean up our waterways, and it is doubtful if they can ever be restored to their original purity.
- It is estimated that the chances of a man's dying between the ages of 50 and 70 from respiratory disease are twice as great if he lives where the air is polluted than if he lives where the air is clean.
- Phosphate plants in Florida have damaged the citrus crops over a radius of 50 miles by as much as 75 *percent*. Gaseous fluorides, absorbed by the grass, and ingested by cattle, have caused a large falling-off in the area's cattle-raising industry.
- There are 39 lung-cancer deaths per 100,000 in rural areas and 52 per 100,000 in cities. The cancer-death rates are proportional to the size of the city. So is the amount of air pollution.
- Deaths by lung-cancer, and complications due to bronchitis, asthma and emphysema have skyrocketed during the past several years, apparently keeping pace with air pollution.
- 5.3 million automobiles will become junk this year. Six years ago, the figure was 4.2 million.
- During the next decade, we will produce 60 million junk cars. The whole automotive industry will face collapse unless that many cars are junked 1976, or sooner.
- We are strip-mining our mountains, spreading ugliness, erosion and unprecedented siltation.
- The mountainous slag-pile which recently destroyed a whole generation of children in a Wales village has its many counter-parts in West Virginia and Kentucky. They constitute booby-traps for the future, while most of those who profited from them are dead and in their graves.
- We have built a steel mill in the Indiana sand dunes, thus damaging a priceless geological treasure.
- We are planning a highway through the California Redwoods.
- It has been proposed that a 530-foot high dam be built on the Yukon River. It would create a lake 280 miles long and 80 miles wide. It would cost $1,300,000,000 and would diminish the annual salmon catch by at least 200,000 fish and destroy an estimated 2,400,000 acres of duck breeding habitat. It would destroy the range for thousands of moose and it would totally eliminate the habitat for a substantial percentage of the Alaskan fur crop.
- It has been proposed that two dams be built in the Grand Canyon and conservation forces are fighting for their lives against this desecration of the greatest single geological phenomenon on the planet.
- Between 1860 and 1960, the carbon dioxide content of the Earth's atmosphere increased by nearly 14 *percent*. It is well known that CO_2 produces a "greenhouse effect" by limiting the reradiation of incoming sunlight. Continued additions of CO_2, causing ever higher temperatures, might be sufficient eventually to melt the Antarctic ice cap and thereby raise the seas of the world by as much as 400 feet. Assuming the process would take 1000 years, the seas would rise four feet every ten years or 40 feet per century. It is clear that such a global catastrophe as this could not have been foreseen from the beginning of the Industrial Revolution. Like so many of the problems now before us, it is possible to see the difficulty only in retrospect. *But, once having seen the undesirable consequence of our well-intentioned action, we should never hesitate to act in order to prevent further aggravation of the problem.* No one foresaw, for example, the great November, 1965, electrical black-out. Will it happen again? No one bothered to test thalidomide on pregnant women *for the full length of*

their pregnancies. Will such a thing happen again? What are the long-range effects of the introduction in 1923, of tetra-ethyl lead as a gasoline additive? Who could have foreseen the incredibly widespread diffusion of lead throughout the world? The highly toxic effects of lead are well-known. Will its use now be curtailed?

- The total explosive power of nuclear tests between 1948 and 1962 was equal to 500 million tons of TNT, about 200 times the power of all the bombs dropped on Germany in World War II. The amount of strontium 90, alone, which was released into the environment equalled one billion grams of radium. By comparison, before World War II, the world supply of radium was approximately 10 grams. After several years of down-grading the effects of fallout, the AEC Biological and Medical Advisory Committee had concluded by 1957 that fallout from tests completed by that date would probably result in 2,500 to 13,000 serious genetic defects per year throughout the world.

- By 1960 the "miracle" detergents had replaced soap as the nation's major cleanser. Some 3.5 billion pounds of the synthetic cleaning agents were being dumped down the American drain annually. *Only then* was it found that the branched-chain hydrocarbon molecules were able to resist bio-degradation by bacterial enzymes in the sewage treatment plants. Thus, rivers were filled with foam and the heads on glasses of water looked suspiciously like beer. Further research, *after the fact*, produced a detergent based upon unbranched hydrocarbon molecules, and by July 1, 1965, the new degradable detergent had replaced its predecessor. However, in septic tank systems (involving about 34 *percent* of the homes in the United States) the detergents do not break down completely, due to inadequacy of aeration, and the result is the familiar fertilizing effect of excess phosphates with its consequence of grave ecological disturbances.

- Sea otters grow fewer on the Pacific Coast. Ships dump their oil in the harbors or along the coasts. The oil gets on the fur of the otter. Then the water penetrates to his skin and he gets pneumonia and dies.

- Penguins at the South Pole have DDT in their fatty tissues. Although DDT has never been sprayed at the South Pole, the penguins have acquired it nonetheless. Like the air which is one atmosphere, the water is one vast ocean. Run-off from the temperate zones has found its way throughout the world. Fish absorbed the DDT, and the penguins ate the fish.

- "The terrifying prospect of spreading poison all over the globe confronts us," according to Senator Gaylord Nelson of Wisconsin. "We now use more than 700 million pounds a year of synthetic pesticides and agricultural chemicals of 45,000 varieties. *This volume is expected to increase tenfold in the next twenty years.* (Italics mine). Many of these poisons persist forever in the environment, and their concentration builds up geometrically as they progress through the food chain (water, seaweed, fish, birds, mammals). DDT residue has been discovered in penguins in Antarctica, in reindeer in Alaska, in seals, and in fish caught in remote areas of the Pacific Ocean. One part DDT in one billion parts of water will kill blue crabs in eight days."

- A similar food chain recently produced some radioactive Eskimos. As a result of nuclear explosions in the atmosphere prior to the test ban treaty, fallout was distributed widely. Lichens in the northern latitudes absorbed the radioactive particles directly from the air. Caribou, for whom lichens are a principal source of food, ingested the strontium 90, and most of it lodged in their bones. Then the Eskimos killed and ate the caribou.

Modern technology confirms the poetic admonition that "no man is an island." Rather, the whole world is an island, a vast space ship, 7,900 miles in diameter. And we have come to the day when we no longer live in the comfortable, padded, undisturbed and ancient environment which step-by-step had emerged from aeons past. But for traces of radioactivity, the world of primitive man was a world of stability, and, withal, it was a world of purity. The corrosive and destructive fractions of Earth emergent had long before combined into inert and bland concomitants of Mankind evolving.

Until our own day, this open steady state has persisted, enabling living communities to survive and to function through the ages. "This pattern, in the words of Paul B. Sears, "has been based on the use of current energy income and a relatively efficient recycling of materials, along with a working equilibrium of numbers. Our great and growing vortices, which suck in fossil energy, water, and the products of field and mine, use them, and then spew out the end products in useless, often dangerous, form, have no counterpart in the natural world."

NUMBERS 35:34 "You shall not defile the land in which you live, in the midst of which I live . . ."

PHOTO BY JACK DERMID

what faraway, consider the situation here in North Carolina. The state, along with many other states, has no air pollution laws, although legislation in this area is about to be enacted. Also, it has now been demonstrated by the recent (January 1967) Consultants' report on the Texas Gulf Sulphur operation in Beaufort County that there exists within the state a great need for improved control of water usage. Underscoring the position of the state's own Water Resources Engineers, the Consultants presented a thorough, carefully reasoned evaluation. A partial statement of their conclusions will serve to show the magnitude of the problem:

"The ground water of the Coastal Plain of North Carolina is a resource of untold value. It will provide water almost indefinitely for industry, agriculture and municipal uses, provided its development is wisely controlled. However, this resource can be destroyed within a few decades if it is exploited unwisely, as it has been in so many areas. The State of North Carolina is fortunate that thus far there has been no serious or widespread intrusion of salt water in the Coastal Plain. Hence the State is in a position to manage the orderly development of the ground-water resources before withdrawals cause irreparable damage . . .

"The Castle Hayne limestone, which underlies the phosphate ore body at the Lee Creek pit, is the most productive water-bearing formation or aquifer in the Coastal Plain of North Carolina. The ground water in the Castle Hayne is sweet water suitable for most domestic, agricultural and industrial purposes. However, it is in hydraulic connection with brackish water in the Beaufort formation immediately underlying the Castle Hayne at the Lee Creek site . . .

"Sea waters that were originally contained in the Castle Hayne limestone and underlying marine aquifers have been diluted or flushed out by fresh waters that circulated through them after they were deposited . . . It is estimated . . . that before pumping began at the Texas Gulf Sulphur pit, 30 million gallons per day of fresh water were discharged from the Castle Hayne limestone into the estuary of the Pamlico River in a 16-mile stretch just down-stream from Washington . . . However, since pumping began, the hydraulic gradient and the direction of flow have been reversed so that the water is now flowing toward the pit from the surrounding area. Thus, whereas formerly water from the Castle Hayne aquifer was rising and discharging into the estuary of the Pamlico it is now moving downward from the Pamlico toward the Castle Hayne . . .

"Existing legislation is not adequate to enable the State of North Carolina to administer the development and conservation of the ground-water resources of the Coastal Plain or of any other region of the State in such a manner as to protect them from wasteful exploitation and degradation, nor to provide for their optimum equitable utilization for all the people . . .

"It is calculated that it would take about six downstream beneath the estuary, to reach the Lee Creek pit; that it would take about 40 years moving five miles; and about 150 years moving 10 miles, considering the average velocities of the water. For example, a small fraction of the ground water would move with velocities ten times those cited.

"The Beaufort formation underlying the Castle Hayne aquifer beneath the Lee Creek pit is in hydraulic connection with the aquifer and contains water with 3,000 parts per million chloride, which will gradually find its way upward to deteriorate Castle Hayne waters. Thus, from vertical and lateral encroachment there is an imminent threat of gradual chloride increase.

"Continued pumping at 65 million gallons per day will surely result in decreasing the supply available for other present and future users and impair the quality under a sizeable area.

"The most feasible remedy is injecting fresh water from one or more of three sources—the Pamlico River upstream, the upper reaches of the Pamlico estuary, and possibly the Peedee formation—into Castle Hayne wells several miles upstream from the Lee Creek pit . . .

"We believe that the Coastal Plain of North Carolina is on the threshold of a period of rapid and extensive development of its industrial, mineral, woodland and agricultural resources. The course of this development will depend, to a much larger extent than is generally realized, upon the continued availability of abundant supplies of potable water. We therefore recommend that immediate steps be taken by the State to promulgate rules and regulations that will provide for the optimum utilization of the ground-water resources that is equitable for all potential water users, without incurring the risks that attend overdevelopment . . .

"Specifically we recommend that the legislative authorization be sufficiently inclusive to cover the following points:

"Establishment of a permit system under which no person or persons would be allowed to install and operate a well or wells to withdraw water from ground-water sources for any purpose whatsoever where the installed pumping capacity exceeds 100,000 gallons per day without first obtaining the approval of the Board of Water Resources . . .

"It is recommended that operators on phosphate leases in the area should be urged to not consider dry pit mining but rather dredging or mining through wells as reasonable methods of ore recovery . . .

"It is recommended that companies now operating dry pit mines be urged, or persuaded, to convert to dredging or other methods.

The problems of the lowered water-table and salt-water intrusion, brought about as the result of Texas Gulf's dry pit mining technique, are still unsolved. Whether the State will require an alteration in the mining procedure remains to be seen. No legislation has yet resulted from the Consultants' report, although several water control bills are being considered.

Important as these two matters are, and they have been given a great amount of publicity in the press, there are other aspects of the Beaufort phosphate mining complex which, despite their potentially critical nature, have received little attention. Unlike the water question, which is a subject not too far removed from everyday experience, the matter of contamination of air and water by several products involved in acid and fertilizer manufacture is a more difficult issue; more subtle in concept and much more diverse in its effects. There are several items to be considered:

1. The emission of gaseous fluorides. Stack emission of fluorine in the form of various fluorides, averaged about 73 pounds per day during the month of March. The figure is low because Texas Gulf has installed a very efficient scrubbing system in the stacks, and for this the company should be congratulated. The experience with gaseous fluorides in Florida and Montana has been disastrous. The livestock and citrus industries, in the Florida case, have been severely damaged within several miles of the immense phosphate complex there. Cattle, absorbing fluorides through the grass, become ill with fluorosis and eventually die. At the present level of production, the TGS operation at Aurora seems to have this problem licked.

2. Gypsum pits. A bi-product of phosphate production is the di-hydrate of calcium sulphate, or gypsum. Huge quantities of this substance are dumped into pits. It is largely inert and does not, of itself, present a pollution problem. However, unless it is carefully washed, traces of phosphoric acid will remain in it. In such a case, any overflow from the pits could be acidic and such acid water, being returned to the stream, could severely affect the fish life there. In addition, the fluorides which are scrubbed out of the stacks are dumped into the gypsum pits at a rate currently of 45,000 tons per year. While no overflow from this closed system is contemplated, continuation of measures to prevent seepage, run-off or breaks due to accident or weather conditions must be given the highest priority if this potential source of massive pollution is to remain merely potential.

3. Oxides of sulphur. During most of March, the H_2SO_4 plant stack emitted sulphur dioxide gas at the rate of about 40,000 pounds per day, and sulphur trioxide at something less than 500 pounds per day. The overall effects of such quantities of these well-known pollutants will require considerable time to evaluate. That they will contribute substantially to the acidity of the area is probable. To what degree, and over how great an area, is dependent upon a variety of factors. One such, in particular, is the meteroiogy involved. The frequency and severity of temperature inversions could have a decisive influence on the impact of the oxides. Given a period of from 3 to 5 days of stagnant air, a period during which there is little vertical movement of gaseous effluent, concentrations in the area could build up quickly, approximating possibly several hundred times those obtaining under normative conditions. In such an event, the effects [illegible] be extraordinary. If one considers that the 3,000,000 tons of phosphate concentrate per year, now being produced, is only the beginning, then it is clear that the figures for effluents of all types will shortly have to be revised upward rather drastically. It has been stated that the complex will be producing 18,000,000 tons of concentrate by 1980, an increase by a factor of six. The accompanying increase in acid production will ascend by a much larger multiple, and with the increase, the prevention of pollution will require a corresponding rise in diligence.

4. Eutrophication. This forbidding word describes a process which, if permitted to occur, will cause the most concern for those North Carolinians who are interested in wildlife. Trace amounts of phosphate, in the presence of sunlight and water, serve to produce a fertilizing effect on plant life in the body of water to which the phosphate has been added. This is largely the story of what has happened to Lake Erie (see above). The additional nutrients cause a rapid increase in aquatic weed growths and algal nuisances. The result is eutrophication, a kind of runaway "blooming" of algae and growth of aquatic weeds, which, if permitted to accumulate over a long period, will destroy the ecological balance downstream.

The principal source of such fertilization at the Texas Gulf plant is the 665-acre slime pond. The finely divided clay which is washed from the phosphate in the early stages of processing is piped into this pond. Mixed in with the clay are small amounts of phosphate. As the clay settles in the pond, the water at the top is returned to the river. At the present time, the concentration of phosphorous in the slime pond water is a minimum of five and possibly ten times the concentration of phosphorous in the river. Figures vary widely, some showing as much as a hundred times the river concentration. But whatever the precise amount, two things can be said with certainty: 1) the concentration in the overflow from the pond is *several* times that of the river, and 2) the quantity will rise as the capacity of the plant is increased. The time is now, therefore, to take remedial action. The effect is a cumulative one, and, once well under way, is difficult to reverse.

The actual concentrations going into the river are in the range of 300 to 400 micro-grams per liter, which is a very small quantity. But the *total* quantity of phosphorous involved is in the range of 50 to 70 pounds per day, since the overflow of the slime pond is 25,000,000 gallons per day. Assuming 50 pounds per day and 350 days per year, the total phosphorous would aggregate 17,500 pounds. It has been calculated that the total phosphorous in the water of the Pamlico sound is just over 1,100,000 pounds. Thus, the input of phosphorous annually is equal to about 1.5% of the total phosphorous of the Sound. Assuming that the volume of the Pamlico River is approximately 5% that of the Sound, the 1.5% figure for the Sound becomes something like 30% for the River. This is, by anyone's reckoning, a substantial amount,

[illegible]

phosphorous could be handled in some other way.

It is still too soon to say with any certainty that substantial eutrophication will take place. However, given the fact that the tiniest amounts of phosphorous will trigger the process, it is safe to say that such an eventuality is probable, especially under the increasing production pressure which will now be continuously rising. It is quite possible that much more algae would already have been detected—a few "blooms" have been noticed—were it not for the relatively low nitrogen content of the water. This concentration is below the 15 parts of nitrogen to 1 part of phosphorous which the optimum algae blooms usually require. Under certain conditions, this limiting factor could be quickly reduced or wiped out; by fertilizer run-off from surrounding farms for example, and thereby a closer approximation of the important ratio could be established. It would be unwise, therefore, to depend upon a shortage of nitrogen as the chief defense against the damaging effects of an excess of phosphorous.

Regardless of the steps necessary, it is better to forestall the eutrophication than it is to attempt to reverse it once it is under way. The stages involved are all too familiar: After a period of continuous fertilization, during which concentrations build up, the stream's character begins to change. (The faster the stream flows, the longer the time required. In the case of the Pamlico, which moves quite slowly, significant effects should be noticeable within a fairly short time.) Some plant forms proliferate. Others are squeezed out. Animal life, reacting to the altered environment, begins to alter also. Some species become reduced in number, others achieve an increase. The algae and other aquatic nuisances, in the process of death and decay, diminish the quantity of dissolved oxygen available in the water. The good fish gradually disappear and trash fish begin to predominate.

The stream is then well-along toward dying, and the process requires much time and expense to reverse, if it is reversible at all. And, if one adds the possible contamination of the stream by various chemicals to the fertilizer problem discussed here, the difficulty is further compounded. Lastly, and may we fervently hope that it never happens: if, through erosion or as the result of a hurricane the 35-feet retaining wall of the 665-acre slime pond with 23 feet of fine clay slime in it (when it is full) should ever be breached, the flowing slime would conclude, just about for good and all, the biological activity of the river.

Fortunately, the Texas Gulf complex is still in the early stages of its operation. As a result, both Texas Gulf and North Carolina have an opportunity to profit from the many examples of grievous and irreparable damage already done to the natural environment in other places. Constant surveillance, a willingness to act and a spirit of cooperation are essential if the undesirable—and unacceptable—long-range consequences of phosphate mining are to be avoided. It would be ironic if

As awesome and spectacular as the power of the dragline and bulldozer are, the more insidious chipping away of our natural resources by "progress" without planning must be halted.

eastern North Carolina, having at last entered upon its long-delayed economic development, should, in the process of accommodating a huge extractive industry, foreclose forever the possibility of utilizing the abundance of natural, permanent and renewable resources to be found along the banks of the Pamlico.

But North Carolina's involvement with Texas Gulf Sulphur is by no means an unique situation. It is only the most spectacular one. Many other industries, particularly those which depend upon the immediate harvest of natural resources continue, more often than not, in the tradition of the short-term gain. This short-sightedness, aggravated by an ignorance of ecological processes, constitutes the foundation of an attitude which often is more destructive than the foul air, the bull-dozers and the drag-lines.

These, then, are the facts. And, taken together, they describe an appalling situation. They point in a calamitous direction and they imply that we are approaching disaster at an ever increasing speed. The facts reveal a colossal indifference to the environment on the part of those who boastfully shape it. Not only an indifference is indicated, but also a failure of understanding of scientific fundamentals.

Every scientist and engineer is aware that the physical world is arranged in such a way that one does not get something for nothing. It is tiresomely affirmed that for every cause there is an effect, that no system is 100 *percent* efficient, that perpetual motion is impossible and that the entropy of the universe is increasing. Yet, having made these formal bows in the general direction of science, the "Builder of Tomorrow's World" is likely to step out of the laboratory and spend his entire life ignoring these basic principles which will play the decisive role in Man's future.

To expect that the waterways and the atmosphere of the world can be endlessly filled with garbage without causing an unwanted and disastrous effect is not only an unscientific position, it is also a stupid one. Perhaps there once was a time, many is, by anyone's reckoning, a substantial amount, to be infinite in extent, and when the atmosphere seemed capable of diluting and dissipating whatever substance was placed in it. If ever there were such a time, it is certainly now past. The limits of both air and water in the squalid role of garbage disposal are now clearly apparent.

If these things are true, if the facts are correct, if the danger is so great and the disaster so near, then one is prompted to ask a very simple question: why do we continue this sorry process? The answer, sad to say, is as simple as the question: briefly put, *we want to do things on the cheap*. It is cheaper to put our sewer pipe into the lake or our open flue into the air than it is to do it another way. At the end of the year, we can proudly show the stockholders a fatter profit. That we are contributing to the destruction of the national, or global, patrimony is a matter that we will defer until a future meeting. And, after things become unbearable, and we are forced to clean up the mess of our own making, a mess from which we have profited, we will probably condemn the government for it's socialism, when, at last, it establishes regulations in response to public outcry.

Such is the sordid character of the problem. How many income and expense statements in our land show fully on the expense side an amount equal to the destruction the companies are causing to the environment? Very few, if any. If an industry destroys the fish of a river, how much has it destroyed? Suppose the fish catch were only $10,000 *per year*, and the pulp mill which killed the river had a tax base of $10,000,000. The river seems to compare unfavorably. But consider that the river might last 10,000 years. What then?

In sum, we are applying only the test of short-run economic advantage. This is the tragedy of our situation. We are buying immediate advantage and paying for it with the precious coinage of the future. We are banking our money and making a charge against our children.

Such a state of affairs was not envisioned by the great Prophets of Modern Science and Technology. They spoke of seeking to harness Nature for the *benefit* of man. That is not what we are currently engaged upon. Rather, we are bludgeoning Nature, and we are achieving momentary benefits. But only momentary. For Nature does not bludgeon very well. She has weapons we know not of, and she enforces—rigidly—the laws, some of which we *do* know. One in particular, Newton's Third, has not been repealed.

It is easy, I realize while watching a piece of earth-moving equipment the size of a house, to become afflicted with a thrill of megalomania. It is possible, as one watches a hillside disappear, to know arrogance, so great is the power of modern technology; but it is a dangerous indulgence. It has been experienced before, and the Greeks called it *Hubris*, or arrogance before the gods, and punishment for *Hubris* was both swift and great.

We, in our own time, are no exception to the inflexible rule. On the contrary, *because* of our greater power we are more susceptible to its ultimate operation. Those who think that they can continue indefinitely to draw their present affluence as a kind of charge against a future which they will somehow manage to subvert when the time comes, are engaged in a tragic game of self-deceit. And they carry all of us along in their wake. They teach us that consumption is really production, that resource shrinkage is really economic "growth," and that Heaven-on-Earth lies just around the next breakthrough.

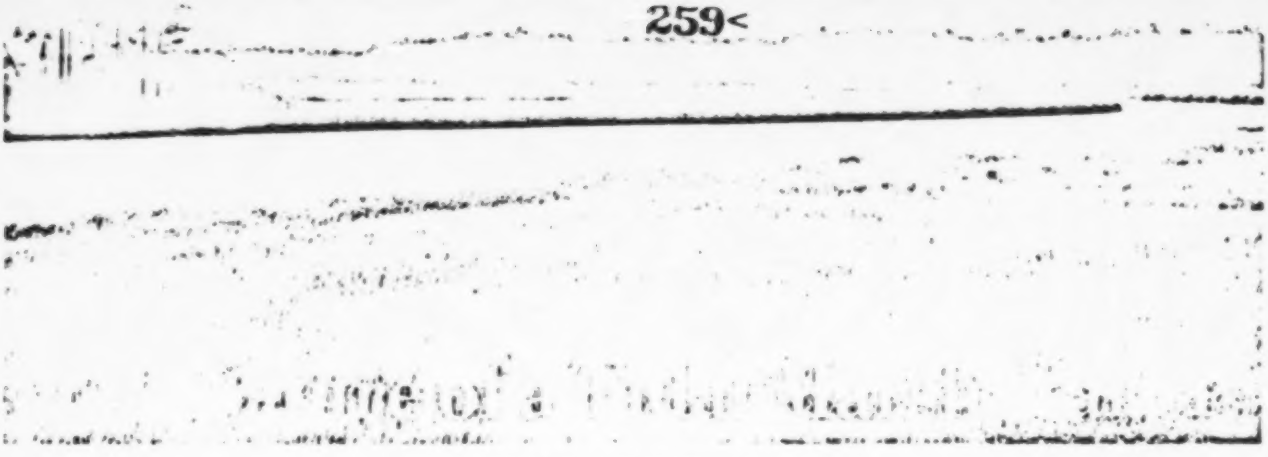
But all this is just a postponement of the eventual reckoning. Staving off disaster and calling it "Progress" has an unmistakable Orwellian ring. And to the extent that retribution might be slower in coming, it will be greater when it arrives.

If we are to stop this downward spiral, if we are to cleanse our environment, if we are to end this gigantic hemorrhaging of our resources, then all of us, scientists, and concerned laymen alike, must alert our fellow citizens to the problems we now face.

Our very survival as a free society depends upon the successful spreading of such vital information. If our citizens are not informed, really informed, informed without varnish or vapid slogans, they cannot make valid decisions. And if they cannot make valid decisions, then the future of our Democracy lies in jeopardy.

In order to achieve the good life for ourselves *and those who come after us*, and to meet our responsibilities as individual citizens in our society, we must address ourselves to the long-range, permanent interests of that society. The awful consequences of our continued failure in such a fundamental enterprise will surpass the wrath of Olympus. ◆

PHOTO BY TOM JACKSON



by Carl N. Shuster, Jr.,
U. S. Dept. of Health, Education and Welfare

YOU can look at a tidal marsh as:

1. A place to dump rubbish and fill.
2. Site of an industrial or storage plant.
3. Site of a cottage development.
4. Channel for marina or entry to docks.
5. Source of salt meadow hay.
6. Mosquito breeding ground, to be drained or treated. Or

1. A spawning ground of game fishes.
2. Food factory for fish in nearby waters.
3. Breeding and rest spot for waterfowl.
4. Breeding ground for a variety of birds, animals and crustacea.
5. A beautiful part of the shore scene—as essential as dunes, hills or forests.

This article, however, views a tidal marsh as one of the most dynamic units of nature. It is a unit (technically called an ecosystem) in which all four of the major earth components — air, land, living things and water—are continuously interacting. The results of this interaction remain in evidence for a long time, since most tidal marshes are thousands of years old. Thus, faced with the dilemma of how to present the reader with a brief glimpse into this complicated, dynamic and long-term natural system, we have selected for emphasis certain attributes of tidal marshes. These will evolve around each of the earth components and how their interactions provide a special environment, recognized by marine biologists as an essential habitat to many fishes and crustacea.

Favorable Land Formations

Since tidal marshes are land forms resulting from the invasion of shallow water by land vegetation, we shall look first at those geological formations best suited to this invasion. The most obvious opportunity for land plants to invade the shallow sea is along the vast coastal plain, which extends along most of the eastern margin of the United States. But, to view this in its proper perspective, we must consider also coastal features which have evolved over thousands of years.

Beginnings in the Ice Age

Perhaps, the last Ice Age is a good starting point. At that time part of the present continental shelf formed the coastal plain and, according to marine biologists at Woods Hole, Massachusetts, George's Bank was a forested island, with coves fringed with tidal marshes. Today the North American continent is less expansive and much of the former coastal area is submerged. Some submergence is still occurring, at a rate of about one foot per century, but the coastal area is just about holding its own due to the seaward transport and deposition by rivers of sediments from inland. In some coastal areas the marshes are being eroded away and literally pushed back onto the upland by the relative local rise in sea level.

One of the best means of visualizing such coastal changes is to refer to the concept proposed by N. Valentin. He explained the upbuilding of a coast or its erosion on the basis of alternative possibilities: The land form is either emerging or submerging in relation of sea level or the beach materials are being deposited or eroded away. Two opposing forces, as deposition *versus* rising sea level, could cancel each other and create a seemingly "stationary" coast. But when the forces coincide, as would occur in a loss of land both from coastal submergence and from erosion of beaches, the rate of coastal change will be most rapid.

During the early stages of submergence, the tendency toward erosion of the shore results in the production of an offshore bar which in time builds above sea level and forms a barrier island. Such islands parallel the shore,

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in the open ocean. On the shores of these bays and those formed by the "drowning" of river valleys or behind sand spits, certain grasses, protected from ocean wave onslaught, can grow. Each succesive generation of grass inches further into once open, shallow water, growing upon the accumulated root stocks of preceding generations and the sediments that were deposited around them.

In time an intertidal plateau of vegetation develops from the region of the former shoreline into an area which had been an intertidal mud flat. The advancing vegetation ultimately fixes the water courses meandering through the flats. High marsh develops to the edge of these channels, but here the progression halts, for the force and volume of the tidal flow maintains the marsh-delineated water courses. Thus, in some areas, tidal marshes are a transitional stage between intertidal flats and the upland.

Corings into salt marshes show this sequence of events in the invasion of the water. Sometimes they also record reversals. The existence of a layer of sand between those of peat indicates that the marsh may have been covered by sand during a hurricane or a rapid, local submergent with subsequent recovery of the grass invaders.

Alternating Water-Air Exposure

From the tides, at least the edges of marshes and the banks of their streams are alternately flooded and exposed on each tidal cycle. Some of these marshes receive the discharge of fresh-water streams, hence each marsh may have a changing salt environment which reflects this discharge in addition to the overall salinity changes which occur in the adjacent bay. The area of the marsh that is flooded depends upon its elevation above the mean water level and its slope from the water's edge to the bordering upland. Thus, the upper reaches of some marshes may be flooded only on high and storm tides.

a change in the kind, abundance and size of vegetation, depending largely upon a combination of a few critical environmental factors, such as air and water temperatures, salinity of the water and duration of inundation, the salinity of the ground water and level of the water table including soil moisture and tidal range and the elevation of the marsh. In most areas with extensive development, the elevation of the marsh and the plants associated with it are recognized as "low" and "high" marsh and species, respectively.

Thus, the vegetation patterns which develop on any given marsh are the result of the selectivity of the environment. Then too, there are the local weather and the seasonal patterns of day length and light intensity as well as species differences—certain plants are northward ranging, others are more southern species. In some marshes there is a prominent fresh-water-induced flora, resulting either from stream flows, drainage, or underground water. Generally, this flora forms a fringe nearest the fresh-water source, in the upper reaches or head portions of the marsh.

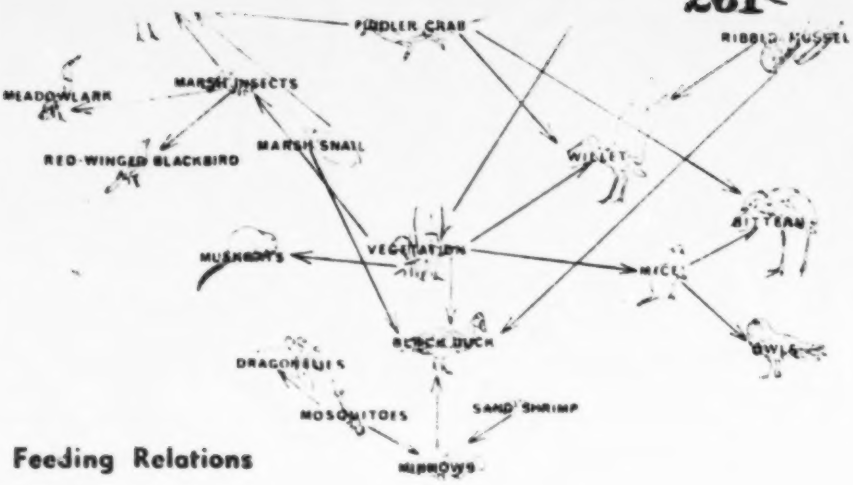
Grasses, Mud Algae—Key Producers

Grasses—cordgrass, salt meadow hay, and spike grass—and the black rush form the predominant visible vegetation of the more saline portions of middle Atlantic coastal marshes. The cordgrass, *Spartina alterniflora*, borders all salt-water courses and covers the low marsh; its stunted form borders slight depressions on the marsh plateau where the salt content of the soil may be twice that of the marsh banks. Some of the depressions or salt pannes are generally devoid of vegetation except for the glasswort, *Salicornia europaea*. This green, translucent and "jointed" plant adds color to the marsh with its fire-red autumn coloration. Cordgrass grows best where the soil is permanently moist and inundation occurs on each tidal cycle; soil salinity is generally

Its protein production is high—air-dried cordgrass is over 3 per cent protein. In infusion cultures inoculated with bacteria and protozoa the total protein yield increases over threefold within a month. If a similar protein build-up occurs naturally in tidal streams, the food available to plankton-detritus feeding animals would be similarly increased.

The high marsh is characterized by salt meadow hay, *Spartina patens*, and the spike grass, *Distichlis spicata*. They are in the zone where more birds nest than elsewhere in the marsh. One of the more attractive, less numerous plants of the high marsh—the sea lavender, *Limonium carolinianum* — produces delicate multi - branched, candelabrum-like sprays of tiny lavender blossoms. Another prominent plant—the black rush, *Juncus gerardi*—is found among the meadow grasses but grows more luxuriantly toward the upland. Among it and on the upland fringe occur sea myrtle, *Baccharis halimifolia*, the seaside goldenrod, *Solidago sempervirens*, species of bulrushes, *Scirpus*, and the marsh elder, *Iva frustescens*. Fringing species in the fresh-water or less saline areas include the cat-tails, *Typha*, and the tall reed, *Phragmites communis*.

In some marshy estuaries a significant plant crop is produced also by phytoplankton—floating microscopic algae—and the large, visible, "leafy" or branching green and red algae which grow on the beds and banks of tidal streams and among the exposed root-stocks of the cordgrass. A more universal and perhaps more prolific producing unit also exists on the surface of the marsh in the intertidal zone. This is the "mud algae" unit comprised principally of pennate diatoms of many kinds; green flagellates, blue-green algae and occasionally dinoflagellates are also present. These mud algae may produce as much as 25 per cent of the crop yield of the marsh grasses, thereby also contributing to the food energy available in marshy estuaries.



Feeding Relations

Small Animals, Few Species

The salt regime of the tidal marsh environment apparently has been a major factor in restricting the number of both plant and animal species that can inhabit the marshes. Among marine animals only a relatively few can adjust to the rapid salinity changes which occur with each tide. Those few species that can endure tidal marsh conditions, however, are relatively free of the kinds of competitors and enemies that harass related species in nearby waters.

The marsh vegetation supports not only a resident population but "migrants" as well, including mammals such as the raccoon and the opossum, several species of song birds, and, at high tide, fishes and crabs. The raccoon, *Procyon lotor*, visits the water's edge at low tide where it digs and eats mussels and crabs. The meadow mouse, *Microtus pennsylvanicus*, moves into the marsh hay zone from the fringing upland. There it takes up residence and feeds upon the vegetation; it is preyed upon by owls and hawks. But the muskrat, *Ondatra zibethica*, is a permanent resident in the less saline parts of marshes where its food, such as bulrushes and cat-tails, is abundant. During the winter, when the marsh vegetation has been flattened by the snows, its low, conical home can be seen rising above the water level.

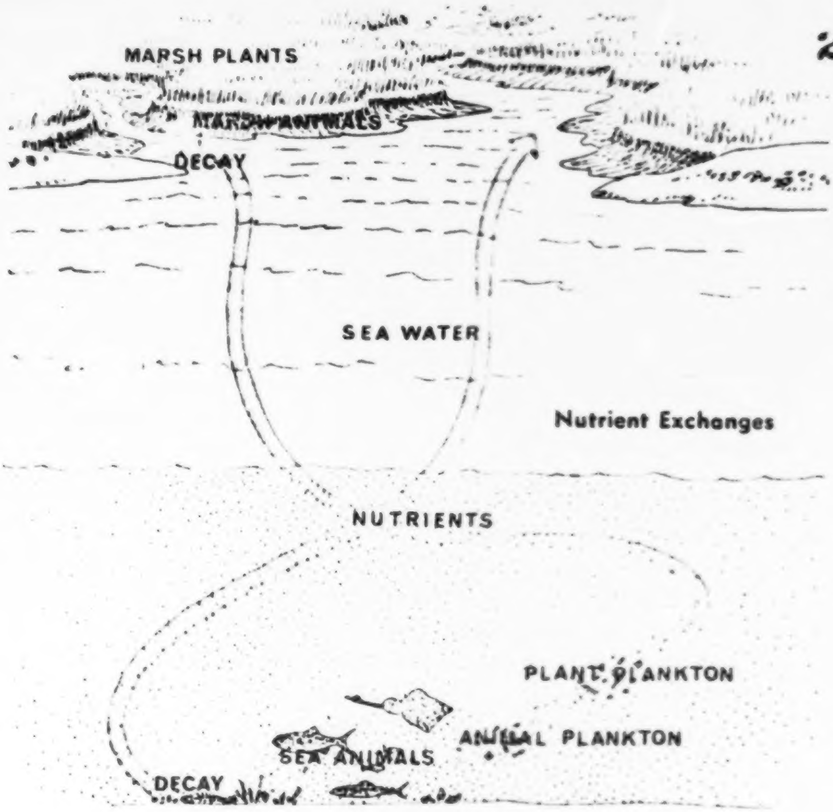
While most species of eastern United States birds may be found in the marshes, only a few species are characteristic of the salt marsh and either breed there or closely frequent it. The more common species include certain rails and sparrows, the black duck, blue-winged teal, certain shorebirds, the marsh hawk, short-eared owl, red-wing blackbird, meadowlark, and marsh wren. Herons frequent salt marshes; the bittern is the only one to nest there.

The popular marsh game bird—the clapper rail, *Rallus longirostris*—is active both day and night, seeking food along the marsh banks on an ebbing tide. Its principal dietary items are small fishes, marsh and fiddler crabs, aquatic insects and snails which it finds attached to the vegetation, and plants. Hundreds of pathways among the dense undergrowth of grasses enable it to run rapidly, taking to wing only if furiously chased, as by a dog. The clapper rail swims with ease, although neither swiftly nor gracefully; it will sink just below the surface, keeping its bill just above the surface. The red-wing blackbird, *Agelaius phoeniceus*, is adaptable to a wide variety of marshy habitats. In tidal marshes it nests among most plant species, but its most frequent and successful nesting occurs in the more robust marsh shrubs. At times, particularly after breeding, the red-wing forsakes its insectivorous diet and descends upon grain fields, where large flocks can be disastrous.

The diamondback terrapin, *Malaclemys terrapin*, is a natural denizen of salt marshes. It hibernates in the muds of the marsh bank, but the female seeks sandy soil well above the high water level to lay her eggs. This reptile is carnivorous, feeding upon dead fish, marine worms, fiddler crabs and various small mollusks which it finds in the tidal streams or on the marsh banks.

Fiddler crabs, *Uca* species, are preyed upon by a wide variety of animals such as herons, terrapins and raccoons. Mounds of freshly-dug, marble-sized pellets mark a burrow entrance. This burrowing activity, particularly in its bringing and releasing nutrients at the surface, is comparable to the action of the earthworm. The marsh crab, *Sesarma reticulatum*, also lives on the banks of the tidal streams. There its feeding on the outer leaves of the cordgrass often creates a bare zone on the marsh plateau paralleling the bank. Its burrows, often two inches in diameter, are distinct from the smaller ones of the fiddler crabs. When it can catch them, the marsh crab will eat fiddler crabs. The ribbed mussel, *Modiolus demissus*, is another prominent species of the low marsh, where it usually grows in clusters among the roots of the cordgrass. Each mussel pumps and filters over one gallon of seawater each hour it is covered by a flooding tide, separating diatoms, bacteria and fine particles of organic detritus from the water. Although they are most prevalent in the marsh bank zone, they also occur on the low marsh plateau.

The tidal creeks of marshes are nurseries for the young of several species of fishes and Crustacea. Usually only a few species are prominent, but upwards of 60 species of fishes have been found in tide marsh streams. Most common are the several species of tidewater minnows, silversides and sticklebacks which may reside there throughout life and the species whose juveniles enter during the summer—menhaden, anchovies, gobies, summer and winter floun-



The constant exchange of nutrients between marsh and sea is diagrammed in the above illustration. This cycle is never-ending unless one of the basic elements is altered or destroyed. At right are but three of the many animal species which make their home in or near the tidal marsh.

der, striped mullet and the oyster toadfish. Small crustaceans are abundant in tidal streams; the planktonic larvae and juveniles of many species can be found there, including those of the marsh and fiddler crabs. Two of the crustaceans — the sand shrimp, *Crago semtemspinosa*, and the opossum shrimp, *Neomysis americana*—are prominent in the diet of many carnivorous fishes, including skates and rays. *Neomysis* is a plankton-feeder, the larger *Crago* feeds on benthic invertebrates as well as plankton species.

On the intertidal flats associated with marshes one often finds the bivalve mollusks, *Mya arenaria*, the soft shell clam and *Enis directus*, the razor clam. These are burrowing species and, like the ribbed mussel, are also filter-feeders, straining their microscopic food from the water by moving it through the gills by ciliary action. These bivalves are often the prey of sting rays and the horse-shoe crab, *Limulus polyphemus*. The latter moves into the shallow water near shore during the breeding season, where its feeding habits are similar to the skates and rays. Each of these different animals—the elasmobranch fishes with their pectoral fins and *Limulus* by its shallow burrowing — creates characteristic puddles on the surface of the flat where it has washed or dug out clams. At high tide *Limulus* and blue and green crabs may invade the low marsh, presumably in search of food.

On the marsh two kinds of snails occur. Periwinkles, *Littorina* species, are found on the cordgrass, whereas the marsh snail, *Melampus bidentatus*, is common on the high marsh in the salt meadow hay zone. This small, coffee-bean-colored snail is an air-breather and climbs up the grass stalks at high water time to keep out of the water. These snails are among the detritus-algae-eating members of the marsh community. Herbivorous insects, those sucking the juices and others eating the tissues of plants, supply in turn the spiders and song birds with food. ◆

The Nature of the Tidal Marsh—Conclusion

by Carl N. Shuster, Jr.

U. S. Dept. of Health, Education
and Welfare

PLANTS contribute two essential ingredients to animals in the tidal marsh complex—food and shelter. We have already reviewed how, under favorable conditions in the physical environment, plants—principally grasses—are responsible for the formation and development of the marsh landform. These marsh grasses and associated plants provide a habitat for animals in the process of evolving their own habitat. Also, other plants bordering the marsh invade it when conditions become suitable for upland species. Now we wish to discuss interrelations among plants and animals on a trophic, that is, food level. These relationships are conveniently summarized by diagrams showing energy sources for the general components of the marsh.

As in other ecosystems—such as woods, grass lands and lakes—the same general relationships and components exist in a tidal marsh. Plants utilize sunlight energy in their growth and reproduction and are the primary producer component. They are a source of food for grazing animals. These animals in turn furnish food for carnivores which may in turn be preyed upon by other carnivores. Bacteria and fungi comprise the component which reduces or decomposes the dead organisms to inorganic level, returning such nutrients as phosphates and nitrates to the marsh system where they are reused by the plants in the manufacture of more plant tissue. It is apparent from the accompanying diagram that there is a continual loss of the energy from one component to the next. This emphasizes the basic role of plants as the primary producers in an ecosystem through fixation of sunlight energy in the form of chemical energy, and in the uptake and recycling of nutrients.

Cycles Affect the Marsh Ecology

In conjunction with the re-use of the nutrients and the one-way flow and ultimate release of the energy first stored by the plant life, the reader should visualize other natural trends and cycles which affect the marsh ecosystem. These include—first in the sequence are those of shorter duration—the tidal cycle with its attendant brackish water flooding and then air exposure of the marsh landform, the daily cycle of light intensity, seasonal cycles of light intensity and air and water temperatures and the long-term geologic relationships between land and water and their relative levels. The seasonality of plant crops, reproductive cycles and activities of animals are easily recognized; we have already discussed some possibilities in geologic trends in the land-water surface relationships, so we will continue with a discussion of some of the changes in plant productivity and animal activity in concert with the tidal cycle.

The tides redistribute nutrients and sediments throughout

This concluded article is contribution number 16 from the Northeast Shellfish Sanitation Research Center, Narragansett, Rhode Island. It is reprinted from the August-September, 1966 New York State "Conservationist".

[illegible] it [illegible] They also undoubtedly affect the over-all primary productivity by decreasing or increasing exposure of the microscopic mud algae and marsh plants or the quantity of phytoplankton that is favorably exposed to sunlight as the volume of water over the marsh changes. At low tide, the crabs are active on the marsh banks. In the hours of dusk, raccoons come out from the upland fringe to prey on them and the ribbed mussels. The mussels feed during the period that they are covered with water.

Another important aspect of tidal marsh ecology is the relatively large ratio of surface area to water area. This ratio favors not only vegetative (primary) productivity but it also provides a large, greatly cut up, sheltered, food-rich habitat which is primarily a nursery area for many species of crustacea and fishes. Technically, the length of the land border in relation to the circumference of a circle, representing the average surface area of the tidal waters within the marsh, is known as shoreline development. The greater the shoreline development — Chesapeake Bay is a prime example— the greater the potential or actual biological productivity. Hence, the amount of land-water boundary in a given area, as well as the shallowness of the water, is an important factor in the tidal marsh ecosystem.

Guide to Viewing a Marsh

From a distance or at first glance, a marsh may appear to be only a meaningless bunch of grass, water and mud flats. A few, simple guidelines will aid the neophyte in obtaining a more complete understanding. It is advisable, for initial observations, to begin with a marsh only a few acres in extent or with a small segment of a larger one. In either case, an area should be chosen where the transition from tidal creek or bay shore to upland occurs within one hundred or so feet. In starting with such a small entity it is easier to obtain an over-all or "bird's eye view" of vegetation patterns and to fol- [illegible]

a straight line from the shore to the upland. This permits the viewer to note the zonation of the few prominent plant species which is a general key to the elevation of the marsh. Actually, as described earlier, the extent of tidal flooding is a major factor in the distribution of the plants, but knowledge of the corollary relationship frees the observer from spending a lot of time in working this out.

Once a marsh has been selected for study and the observer wishes to proceed beyond just viewing the marsh scene, there are various ways in which to document the observations. Among the easiest and most illustrative, is color photography. When this is used throughout the year to record the over-all marsh scene, with close-ups of the prominent species—particularly the flowers and fruits of plants, the resulting photographs provide an excellent sequence by which the novice can become familiar with the seasonal appearance of the plant and animal life.

In addition to this, the more adventuresome may wish to map the plant and animal distribution along a transect or over a wider area of the marsh. With very little expense and effort, the transect study can be combined with a profile of general elevation. To do this I often use a line level, a 3-meter measuring tape, cord at least long enough to be divided into two 10-meter sections and several stakes of equal length.

If arriving by boat, the above equipment can be used to ascertain the height of the marsh edge above the water level. Special care must be taken when working along marsh banks for some, with deep, sticky mud, can be quite treacherous. Starting with the initial stake, the rest are used at 10-meter intervals to record the change in relative elevation. Trowel-dug holes next to each stake, down to the water table, will provide water samples for ascertaining salt content. Further, simplified mapping of the vegetation can be accomplished using an angle mirror to grid the marsh surface in [illegible]

side. Then the plant and animal distribution can be plotted on a graph paper representation of either the transect-profile or the grid. These plots generally reveal a distinct pattern zonation in relation to marsh elevation. Observations on seasonal changes particularly the times of appearance, persistence and abundance of plants and animals, provide additional information upon the dynamics of marsh life. If a cement post is partially sunk into the marsh, it will serve as a reference point for several years.

Such studies are fun and instructive to young and old. For Boy Scouts they can serve also to fulfill part of the requirements for the nature merit badge. For adults, they show values to be balanced against the drive of society to drain and change for short-term profits. ◆

Selected References

Chapman, V. J., 1960. Salt Marshes and Salt Deserts of the World. Interscience Publ., Inc., N. Y.

Dexter, R. W., 1947. The Marine Communities of a Tidal Inlet at Cape Ann, Massachusetts: a Study in Bio-Ecology. Ecol., Monogr., 17(3) :261-294.

Miller, W. R., and Egler, F. E., 1950. Vegetation of the Wequetequock-Pawcatuck Tidal Marshes, Connecticut. Ecol. Monogr., 20(2) :143-172.

Odom, E. P., 1961. The Role of Tidal Marshes in Estuarine Production, N. Y. State CONSERVATIONIST, June-July, 12-15, 35.

Teal, J. M., 1962. Energy Flow in the Salt Marsh Ecosystem of Georgia. Ecology, 43 (3) :614-624.

PHOTO BY JACK DERMID

CARTERET COUNTY NEWS-TIMES

Thursday, July 18, 1968

EDITORIALS

OTHER VIEWS

Readers Write

Williston, N.C.
July 12, 1968

TO THE EDITOR:

This letter is in reference to recent articles and editorials in the NEWS-TIMES relating to the development of the Cape Lookout Seashore and the dwindling fish resources, marshlands, and estuaries.

As I read the law authorizing the Seashore, its purpose was ". . . to preserve for public use and enjoyment an area in the State of North Carolina. . . which shall comprise the lands and adjoining marshlands and waters on the Outer Banks of Carteret County, North Carolina . . .". Section 5 of the law states that the Seashore shall be administered ". . .for the general purposes of public outdoor recreation, including conservation of natural features contributing to public enjoyment."

Yet one of the first major developments in the Seashore is to cut a "boat" or "borrow" channel through the "adjoining marshlands" which are the last remaining natural stabilizer of the Outer Banks. The proposed channel would be over 50 miles in length, 160 feet in width, and a maximum depth of 10 feet. Thus in one operation a minimum of 1,000 acres of vital marshlands would be destroyed forever.

AUTHORITY for this channel is contained in Section 6 of the law, which provides that the Corps of Engineers shall "undertake or contribute to shore control or beach protection measures. . .that is consistent with the purposes of this Act." I consider that the proposed channel is NOT "consistent with the purposes of this Act".

The reported purpose of dredging this channel is to obtain "material for sand dunes and the berm." Why not obtain this material by dredging and deepening the present boat channel in Core Sound? This may prove more costly, but the long range benefits would more than offset the added costs and it would be complying with the law by preserving the marshlands. Coincidental with the building of the shore and hurricane protection berm and sand dunes, three inlets would be filled.

It has also been my observation that when drag-lines, dredges, and other earth moving equipment move into an area, very little attention is ever paid to natural environment. I am just not one of those people who believe that man can improve on God as regards the preservation of our natural resources. As an example, since the livestock was removed from the Outer Banks, it is amazing how much vegetation and grasses have grown on areas that were formerly bare sand; and there are again small sand dunes.

DISCOUNTING the illegal aspects of this proposed channel, a more disturbing aspect is the long range adverse effect such a channel would have on the sport and commercial fishing industries. From what I read and am told by marine biologists, the estuarine areas and wetlands (particularly the marshlands) are vital to the survival of the fish resources, as spawning grounds and sanctuaries for maturing. For the five-year period ending in 1965 the coastal fish resources from Maine to Florida were down 50 percent for 18 species important to sport and commercial fishermen. The situation was attributed to the POLLUTION OF ESTUARINE AREAS AND THE ANNUAL LOSS OF THOUSANDS OF ACRES OF ATLANTIC COASTLINE WETLANDS.

I believe this proposed channel would be the first step in the systematic destruction of these marshlands. It would mean more boats, more dredging to provide boat landings and marinas, more people and more indiscriminate pollution and littering of the marshes and Outer Banks. It would provide unlimited access to properly control and police the flow of people and boat traffic in the area.

Arguments favoring the proposed channel are somewhat specious. One is that the channel would provide water transportation for the commercial fishermen in moving their products to markets. Already we have for this a perfectly good and adequate boat channel in Core Sound.

I WOULD ALSO suggest that probably 99 percent of the seafood products taken from Pamlico and Core Sounds are now moved to the markets by trucks from the communities bordering on these sounds, and which are more convenient and less costly to the fishermen. Another argument is that this channel would help carry away the excess water which builds up in Core Sound during strong northeasters and hurricanes (similar to the "1933 storm" which did so much damage to the Outer Banks when the "wall of water" finally broke through the dunes to the Atlantic Ocean and opened up Whalebone, Swash, Sand Island, and ~~[illegible]~~ Drum Inlet).

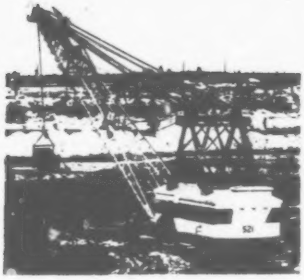
On the contrary, it would seem to me that such a channel would aggravate the flooding in the North River area and Beaufort; particularly, when three inlets, which ordinarily take some of this excess water to the ocean, would be closed.

One final argument is that the channel would provide another convenient channel for fish to move in. My reply is that Core Sound is already quite adequate for any anticipated fish movements in this area. Also, fish usually moving into and out of the marshlands are there to spawn and seek sanctuary.

THERE IS currently before Congress the Estuary Study Bill, in which during committee hearings on the bill, the "principle is fully established that estuarine areas should be preserved as the most important seafood habitat of coastal areas." How then can Executive branches of the Government proceed with a nonpreservation project in these marshlands, which is contrary to this established principle of Congress?

I can see no logic or valid reason for justifying this proposed channel. It seems to me to be a short-range project to obtain "material for sand dunes". For the long-haul, a more permanent project (even if it initially proves more costly) would be to obtain the required material from the present boat channel in Core Sound; and open and stabilize the [illegible] inlets; and leave the marshlands intact as the last remaining natural stabilizer of the Outer Banks.

Sincerely yours,
J. W. DAVIS
Rear-Admiral
USN (Retired)



TGS president talks about PHosphate PHuture

(NOTE: The following is part of an address by Claude O. Stephens, president of the Texas Gulf Sulphur Co., at the North Carolina dinner, Congressional Rivers and Harbors Congress, Washington, D. C., June 4, 1968.)

For most of Texas Gulf's first fifty years, the company's business was based primarily on one product – sulphur. Unlike phosphate, sulphur is a bulk commodity. It must be produced where it is found, and then shipped all over the world to the markets where it is an essential ingredient in the manufacture or processing of nearly every product of modern living.

Since most of these markets are far removed from the source of supply, economical transportation is as important to our industry as exploration and mining. Indeed, as much as two-thirds of the cost of a bulk commodity could be and sometimes is in transportation. To be competitive in world markets, and to help make possible the opening up of new markets – a company in an industry such as ours must become expert in all aspects of transportation, including development of storage and distribution centers. Between 70 and 80 per cent of our sulphur is shipped by water. This of course is because shipment by water is by far the most economical method of transporting a bulk commodity. We have fleets of barges for shipment by river and intracoastal waterways, ocean-going vessels for shipment to coastal ports and overseas, and a network of storage terminal facilities on the east coast, in the midwest and even abroad.

I would like to discuss with you the importance of water transportation to the development of the phosphate industry of North Carolina.

When Texas Gulf began preliminary phosphate explorations in North Carolina, it was already clear that the development of a new source of phosphate was essential to meet the rapid growth in demand in the nation and worldwide. It was also clear that if North Carolina provided such a source, it would be ideally situated to serve world markets. We are proud of the success of our exploration team in delineating a major phosphate reserve in Beaufort County. Full credit should also be given to North Carolina authorities who made this discovery possible.

Our exploratory drilling was carried out in 1962, and metallurgical tests of the core samples were made at North Carolina State University Minerals Research Laboratory located in Asheville. In August of 1963 we began a full-scale mining test at Lee Creek, to select the best method of mining. More than three million dollars was invested by Texas Gulf in this initial work.

Our development of the Lee Creek mine, mill and chemical complex, has now grown to an investment of more than $90 million. Many aspects of careful planning went into this project. Full-scale mining test was done both to evaluate the economic feasibility of mining ore to depths of 150 feet, and also to insure that the method selected would not endanger in any way the area's essential and abundant water resources. We maintain monitoring operations and cooperate with state authorities to insure that the quality and quantity of water resources of the area will be safeguarded and preserved.

As our mining progresses from one area to another, we do not intend to leave a scarred earth. In late 1963, before mining development on a large scale was begun, we asked North Carolina State University at Raleigh to study and recommend best use of the land before and after mining. We are following their recommendations for livestock raising and a reforestation program. We hope that these programs will add further to the economic vitality of the community without competing with existing businesses.

Before mining operations began, studies of fish and marine life in Pamlico River were initiated at our suggestion and with our support. These studies, which are continuing, are conducted by specialists from North Carolina State University. We have provided our plants with the most modern equipment for abatement of water and air pollution.

I am pleased to say that the State government of North Carolina has shared our faith in the importance of, and the future of, the North Carolina phosphate industry. Former Gov. Terry Sanford and North Carolina's former state geologist, Dr. Jasper L. Stuckey, made it possible to have a phosphate industry in North Carolina by encouraging leasing of State owned phosphate reserves underlying Pamlico River and its tributaries. Texas Gulf and other companies have acquired mining rights to prime phosphate land, by competitive bidding. It has now been established that North Carolina's phosphate reserves are among the largest in the world. The reserves of the largest producing area in the United States – Florida – may be mined for decades. North Carolina's reserves will last for hundreds of years.

In 1965, as the need for deep-water shipping facilities to and from other parts of the world began to take shape, Governor Dan K. Moore and the North Carolina State Ports Authority, under the able leadership of Mr. John M. Reeves and Mr. E. N. Richards, further evidenced faith of the State of North Carolina in the future of North Carolina phosphate. The State agreed to build and operate a bulk materials handling facility at Morehead City. This facility includes a 106,000-ton capacity warehouse and a conveyor loading system capable of handling 2,500 tons of phosphate rock per hour. We look forward to the dedication of this facility by Governor Moore on Aug. [illegible]

Norfolk Southern Railway Company, a service-minded railroad with its home office in your capital city of Raleigh, also exhibited great faith in North Carolina phosphate by building a 31.5 mile spur track to the Lee Creek mine at a capital cost to the company of $3¾ million.

Let me give you an indication of the importance of North Carolina's phosphate reserves and the availability of economic waterborne transportation. Phosphate is one of the three major ingredients in fertilizers. The element phosphorus, contained in phosphate is essential to plant growth. There is no question that North Carolina phosphate can and will have a significant affect on the future world food supply.

Claude O. Stephens

President of Texas Gulf Sulphur Co.

Appropriately a North Carolinian, Dr. H. Brooks James, Dean of the School of Agriculture and Life Sciences at North Carolina State University has been selected by the President to head the country's International War on Hunger Program, as an assistant administrator of the Agency for International Development. The appointment of a man like Dr. James to such a position reminds us again that the most pressing business of the world in future years may well be the production of food, which can only be made possible by more and better fertilizer materials.

There are other uses for phosphate – detergents, food processing and metallurgy – but the fertilizer industry consumes more than 70 per cent of phosphate production. United States demand for phosphate for fertilizer is increasing about 8 per cent per year and world demand is growing at 6 per cent. To fulfill the Free World increase in demand of between 2½ and 3 million tons annually would require the equivalent of a new Lee Creek mine every year.

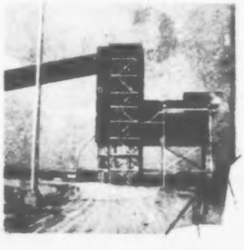
North Carolina, with its large phosphate rock deposits located close to deep water, is in an enviable position to serve the world's growing demand for phosphate. Initial design capacity of Texas Gulf's Lee Creek mine, the only company now in production in North Carolina, is three million tons of phosphate rock a year. Long-range we foresee the North Carolina phosphate industry, as a whole, producing more than 15 million tons per year. It will take its place among the world's largest phosphate producing areas.

The importance of water transportation to the phosphate industry and other industries of North Carolina is of course more than a question of the costs of shipping products out. Currently about half of the phosphate produced at Texas Gulf's Lee Creek mine is used to produce fertilizer materials at our plants there. Phosphate rock is combined with sulphuric acid to produce phosphoric acid, which in turn is used to produce superphosphates and other fertilizer materials. Sulphur must be brought in from Texas or other sources of supply. Fuel and ammonia also must be shipped in, and again water is the most economical method of transportation.

While we are pleased that we have the new loading facility at Morehead City, it ought to be our long-range objective to continue thinking about bringing deep-draft ocean-going vessels up Pamlico River by means of a deep channel. The ability to load a ship with phosphate materials at Lee Creek in addition to Morehead City would further cut costs of water transportation from Beaufort County. If the North Carolina phosphate industry develops as anticipated, by the 1980's savings in water shipment costs could be in the range of $20 million per year. Such savings will enable North Carolina to compete more effectively, and thus enlarge potential world markets for this area.

The opportunity for expanding world trade applies to many products in addition to phosphate. A deep-water channel will add substantially to the economic development of the region. But I strongly believe that to postpone construction of the channel until there is further industrial growth is putting the cart before the horse.

By increasing supplies of essential foods and clothing, North Carolina is already contributing substantially to the world's basic needs. Much more can and must be done to satisfy the aspirations of people everywhere for a better standard of living. Only by improved and enlarged water commerce can the ultimate goals of increased world trade be achieved.



Water Hearing Scheduled At New Bern on July 26

By ROY PARKER JR.
News and Observer Bureau

WASHINGTON — Against a backdrop of growing controversy over pollution standards, a federal hearing on coastal water conditions in North Carolina is scheduled for July 26 in New Bern.

The U. S. Water Pollution Control Administration will conduct the hearing as part of a nationwide series ordered by Congress.

All interested parties are invited to testify at the hearing. The information will become part of a report due to be delivered to Congress in late 1969.

The national estaurine study was ordered by Congress as part of the Clean Water Restoration Act of 1966 and is expected to lead to new laws and policies governing pollution of the sounds, bays, harbors, and river entrances which make up estuarine areas.

Secretary of Interior Stewart Udall said: "These public meetings give all individuals and organizations with an interest in the future of the nation's coastal waters and estauries an opportunity to express their views on what ought to be done to assure wise management of these invaluable resources."

North Carolina has several unresolved estaurine controversies. They include the question of industrial waste dicharges in major rivers flowing into coastal sounds; pollution by military cantonments; preposed development of several natural features either for resort or industrial use, and proposals for public works projects which might alter the character of estuarine areas.

In addition, the State is balking at federal demands for stiffer water pollution control rules to maintain water quality standards against the impact of industrial or other commercial development.

The agency, which will hold the July 26 hearing, is a unit of the Interior Department, which has sought the stiffer standards and which also is skeptical of public works projects which might alter the North Carolina estuarine landscape.

The hearing, one of four scheduled throughout the country this month, will begin at 9 a. m. in the Craven County Courthouse in New Bern.

Bid Calls This Week For Harbor Projects

What happened to us, We pay Taxes Too.

OCRACOKE — Rep. Walter B. Jones, D-N. C., First District, said Saturday the U. S. Army Corps of Engineers will call for bids this week on maintenance dredging in Silver Lake Harbor here and in Beaufort Harbor at Beaufort.

He said the engineers plan to call for bids Tuesday to be opened Aug. 15. The project consists of the removal and disposal of about 85,000 cubic yards of shoal material, including allowable overdepth dredging.

Jones added that he is hopeful the work at Ocracoke can be further augmented in the near future. He pointed out that a project which would deepen Silver Lake Harbor to 12 feet has been approved by the House and by the Army engineers. Presently, he said, it is awaiting Senate approval, final action that would clear the way for financing of the project from 1969 budgeted funds.

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If we had 5 ft we would be in good shape. You can see we aren't the only ones who have trouble with our Fed. Representative.

Shallow Bogue Inlet Trims Fishermen's Profits

By Frank M. Roberts

SWANSBORO, N. C. — For many years, fishermen here have been faced with a heartbreaking problem: Bogue Inlet is so narrow, that most of the boats can't get through.

The smaller ones make it with a struggle, often scraping bottom, but the bigger ones can't even make it under the best of conditions.

Col. Beverly R. Snow Jr., District Engineer representing the U. S. Army Corps of Engineers, says however that "further improvements and stabilization could not be justified at the present time."

The idea of "to widen or not to widen" Bougue Inlet affects about 500 people, directly and indirectly, who depend on the White Oak River inlet for their living. According to James Walker, a politically active Swansboro resident, "Over $2 million had been allocated for Bogue in 1966, but no money has been spent there."

The former seafood restaurant owner has often attacked his Washington representative, Congressman David Henderson, for showing "very little interest in the situation." Henderson countered by saying that "my file is literally several inches thick concerning activity relating to Bogue Inlet, almost from the time I was sworn in (January, 1961) to the present."

Both men agree on one thing: They would like to see the job done. So far, the only thing accomplished has been some dredging work by the Corps of Engineers. Former Mayor Carl Milstead said, "That was the only time in the last 11 years that anything was tackled."

SWANSBORO MAYOR Linwood Williams points to the Bogue Inlet area from dockside where many sport and commercial fishing boats are tied up.
—Photo by Frank Roberts

Jesse Moore, who fishes commercially in the White Oak River, added, "It did more harm than good. The dredge tore up the loose sand and the tide took it away. It even took the sand we did have."

Another area fisherman, Vince Ward, complained that, "The inlet doesn't need dredging anyway. It needs to be jettied." He suggested the use of abandoned Liberty ships from the Wilmington area. "We could use them to jetty the inlet and then fill 'em full of sand." Ward said that the cost would be nominal.

Cost factor for the work is another bone of contention. According to Lt. Gen. W. K. Wilson Jr., Chief of Engineers (Washington, D. C.), in a report made to the Secretary of the Army, "Deepening and stabilizing Bogue Inlet is infeasible due to excessive costs."

Onslow County Commissioner Hugh Ragsdale felt otherwise, stating that "Not much money would be involved." He also said that the state would do the work, rather than the Corps of Engineers, but the Corps would have to approve the job.

Money is not only a sore point in improving Bogue Inlet; fishermen's profits are directly concerned. It's estimated that fishermen in nearby Morehead City get about $100 a day, while Swansboro fishermen can only make about $70. The inlet in Morehead is in better shape, so fishermen from that area make more money, even though they fish in the same waters.

Widening of the inlet would not allow more boats to get through, but it would also mean more fish and shrimp in the sound, plus less water stagnancy [illegible] other problems that Swansboro area fishermen have to contend with.

Widening seems a long way off through. E. G. Long Jr., of the U. S. Army Corps of Engineers said that "We're not authorized to maintain depths greater than 6' on a bar." In 1964, according to Maj. Robert L. Bouffard, also of the Corps of Engineers . . . "Contacts with local interests determined that a controlling depth of 7' at mean low water was still available."

This reporter went boating with fisherman Vince Ward. A depth recorder on the boat showed that there was just 5' at high tide. The waters were extremely rough and Ward could only be guided by the whitecaps.

OLD PROBLEM

In a 1962 resolution by the Board of Commissioners of Onslow County, it was stated that Bogue Inlet created a serious problem for the "navigation of both commercial and pleasure boats, by reason of the fact that there is not more than 4' of water on the bar during low tide." Depth determination seems to depend on the time of day an investigator visits the area.

If Bogue Inlet should ever be fixed so that area fishermen could make a decent living, it would mean that one of North Carolina's major inlet problems would be solved. Capt. John Wood, a retired Marine who now fishes commercially in the waters of White Oak, said, "Bogue is probably the worst inlet on the North Carolina coast."

Because of that, Wood and others like him have to do most of their shrimping during the day instead of the more profitable after-dark hours. Wood recently built a big, new boat. "I would have liked to have made it even bigger, but it couldn't get through."

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New Bern, North Carolina
July 26, 1968

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